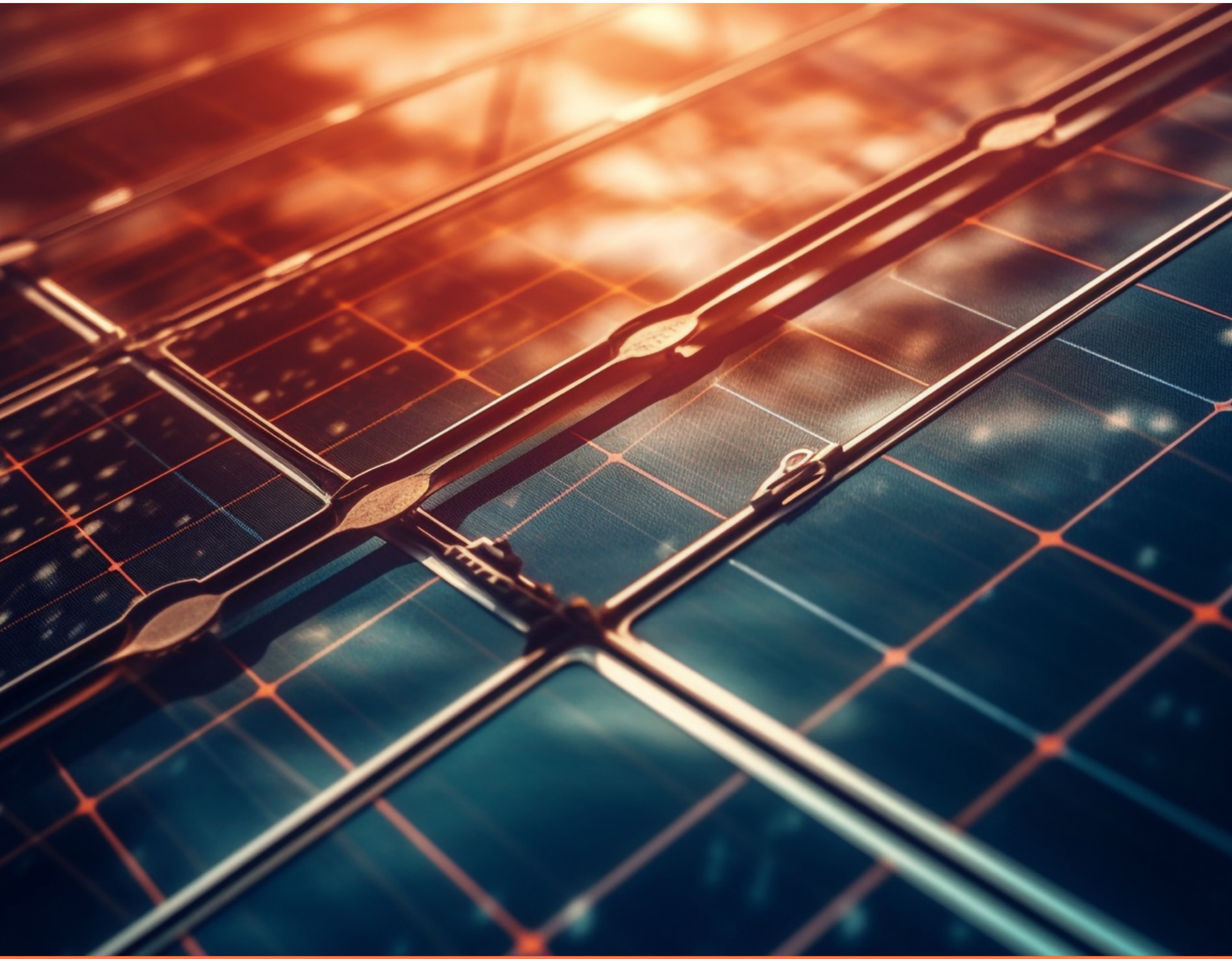
Coalition On Materials Emissions Transparency



# Green Public Procurement: How to Fulfill the Promise of Decarbonizing the Hard-to-Abate Sectors

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A JOINT CENTER OF COLUMBIA LAW SCHOOL AND COLUMBIA CLIMATE SCHOOL

## About

The Coalition on Materials Emissions Transparency (COMET) accelerates supply chain decarbonization by enabling producers, consumer-facing companies, investors, and policymakers to better account for greenhouse gas (GHG) emissions throughout materials supply chains, in accordance with existing GHG accounting and disclosure methods and platforms.

The Columbia Center on Sustainable Investment (CCSI), a joint center of Columbia Law School and Columbia Climate School at Columbia University, is a leading applied research center and forum dedicated to the study, practice, and discussion of sustainable international investment. Our mission is to develop and disseminate practical approaches and solutions, as well as to analyze topical policy-oriented issues, in order to maximize the impact of international investment for sustainable development. The Center undertakes its mission through interdisciplinary research, advisory projects, multistakeholder dialogue, educational programs, and the development of resources and tools.

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# Acronyms and Abbreviations

| | |
|---|---|
| **BF-BOF** | Blast Furnace - Basic Oxygen Furnace |
| **CAPEX** | Capital Expenditure |
| **CCfD** | Carbon Contracts for Difference |
| **CCS** | Carbon Capture Storage |
| **CfD** | Contract for Difference |
| **CFP** | Carbon Footprint of Products |
| **$CO_2$PL** | $CO_2$ Performance Ladder |
| **CSC** | Concrete Sustainability Council |
| **DRI** | Direct Reduced Iron |
| **DRI-EAF** | Direct Reduced Iron - Electric Arc Furnace |
| **EAF** | Electric Arc Furnace |
| **ECI** | Environmental Cost Indicator |
| **EPA** | Environmental Protection Agency |
| **EPD** | Environmental Product Declarations |
| **ESG** | Environmental, Social, and Governance |
| **EU-ETS** | EU Emissions Trading System |
| **EUA** | EU Allowance |
| **FMC** | First Movers Coalition |
| **GDP** | Gross Domestic Product |
| **GHG** | Greenhouse Gas |
| **GPP** | Green Public Procurement |
| **GSA** | General Services Administration |
| **IDDI** | Industrial Deep Decarbonization Group |
| **IEA** | International Energy Agency |
| **KEITI** | Korea Environmental Industry and Technology Institute |
| **KONEPS** | Korean Online E-Procurement System |
| **LCA** | Life Cycle Assessment |
| **LCC** | Life-Cycle Costing |
| **MEAT** | Most Economically Advantageous Tender |
| **OECD** | Organisation for Economic Co-operation and Development |
| **OEF** | Organization Environmental Footprint |
| **OPEX** | Operating Expenditure |
| **PCR** | Product Categories Rules |
| **PEF** | Product Environmental Footprint |
| **PEFCR** | Product Environmental Footprint Category Rules |
| **PPA** | Power Purchase Agreements |
| **SDE++** | Sustainable Energy Production and Climate Transition Initiative Scheme |
| **SME** | Small and Medium-sized Enterprise |
| **SPP** | Sustainable Public Procurement |
| **UN** | United Nations |
| **UNIDO** | United Nations Industrial Development Organization |

## Executive Summary

Green Public Procurement (GPP) has great potential as a transformative approach for governments to leverage their extensive purchasing power to influence decarbonization, particularly in hard-to-abate sectors such as steel and cement manufacturing. GPP action can mitigate the substantial emissions contributions of these industries by shifting market demand towards low-carbon alternatives. Tapping into the full potential of GPP not only supports the absorption of the initial 'green premium' necessary to propel technological development for industrial decarbonization but also fosters innovation that scales low-emission technologies to achieve cost competitiveness compared to conventional methods.

However, harnessing the potential transformative impact of GPP in industrial decarbonization entails the implementation of several key foundational requirements. A well-structured GPP system requires a robust governance framework characterized by institutional leadership, regulation, and accountability capable of setting specific and escalating quantitative targets aligned with forward-looking climate criteria. It is crucial that these targets are based on clear and standardized quantification methods so they guide procurement practices effectively, ensuring that GPP can fulfill its role as a key driver of industrial decarbonization. For this system to have an effective impact on decarbonization, strict monitoring and compliance mechanisms must be included in legal frameworks and contracts. Most importantly, GPP systems should align with national decarbonization pathways and evolve in tandem with market developments.

Despite the strategic importance of GPP implementation, countries that have adopted GPP policies often set voluntary targets, use inconsistent accounting methods and standards, and have deficient governance structures that lack the capacity to implement robust GPP systems. Consequently, the uptake and effectiveness of GPP in reducing GHG emissions and advancing climate mitigation are not fully realized. As a result, it is critical for GPP to evolve from a passive to a proactive procurement mechanism by designing innovative procurement tools that spur the development and adoption of nascent decarbonization technologies in the heavy industry. Doing so would bridge the gap between current practices and the potential of GPP to drive industrial decarbonization.

Among these innovative tools, the $CO_2$ Performance Ladder ($CO_2$PL) and Carbon Contracts for Difference (CCfDs) stand out. The $CO_2$PL, used as both a carbon management system and a procurement tool, integrates carbon management into preferential buying procurement processes, thereby promoting greener practices among companies. On the other hand, CCfDs act as financial instruments designed to generate stable revenue streams for companies adopting green technologies, effectively subsidizing the green premium and shielding companies from volatility in carbon markets. These innovative tools evidence the success associated with unlocking GPP's potential to contribute to industrial decarbonization.

Taking steps in the right direction, such as these examples, and succeeding in a broader implementation of GPP has the added potential to catalyze private sector investment in emerging green technologies, fostering significant economic growth and job creation. By setting standards through public procurement, governments can inspire a model for private sector adoption, enhancing the collective impact on industrial decarbonization and establishing a profound ripple effect across various industries. To materialize this promising path toward accelerated hard-to-abate decarbonization, GPP's success is yet to be unlocked and depends on governments' willingness to overcome implementation barriers and work to employ innovative tools that go beyond voluntary targets and scale nascent decarbonization technologies. These steps would ensure that GPP satisfies immediate decarbonization needs while supporting long-term sustainable development.

# I. Introduction

Public procurement pertains to a government's purchase of goods and services. Public procurement accounted for approximately 12% of the global gross domestic product (GDP), as last reported by Bosio and Djankov and the World Bank in 2020.[1] In OECD countries, public procurement represented almost 13% of GDP in 2021.[2] In many developing countries, the government is the largest purchaser of various goods and services, with up to 30% of GDP coming from public procurement, according to pre-COVID metrics.[3] This is a substantial portion of the GDP, which underscores its economic significance. Given governments' vast purchasing power, public procurement can and should be a strategic tool for addressing economic, social, and environmental concerns.

**Sustainable Public Procurement** (SPP) emerged – and started to be actively promoted by UNEP since 2005 – to leverage governmental purchasing power to procure more goods and services that have fewer negative impacts in the economic, social and environmental spheres, and promote sustainable development.[4] Instead of focusing only on the lowest cost, SPP considers a range of social, environmental, and economic sustainable criteria to ensure value for money. The European Commission describes SPP as an approach to achieve the equilibrium between economic, social, and environmental factors during procurement.[5]

1 "Global Public Procurement Database: Share, Compare, Improve!" *The World Bank*, March 23, 2020, https://www.worldbank.org/en/news/feature/2020/03/23/global-public-procurement-datab; Erica Bosio. Simeon Djankov, Edward Glaeser, and Andrei Shleifer, "Public Procurement in Law and Practice," *American Economic Review* 112, no. 4 (2022): 1091–1117, https://doi.org/10.1257/aer.20200738.

2 *Government at a Glance 2023* (Paris: OECD Publishing, 2023), chapter 7, https://doi.org/10.1787/3d5c5d31-en.

3 *Factsheets on Sustainable Public Procurement in National Governments: Supplement to the Global Review of Sustainable Public Procurement* (Nairobi: United Nations Environment Programme, 2017), https://www.oneplanetnetwork.org/sites/default/files/factsheets2017.pdf.

4 *Marrakech Task Force on Sustainable Public Procurement Led By Switzerland* (Nairobi: United Nations Environment Programme, May 2011), https://sustainableprocurement.eu.com/documents/MTFonSPPReportCSD19FINAL.pdf.

5 "Green Public Procurement," European Commission, https://green-business.ec.europa.eu/green-public-procurement_en#:~:text=Sustainable%20Public%20Procurement%20(SPP)%20is,all%20stages%20of%20the%20project.

Within the broader framework of SPP, **Green Public Procurement** (GPP) focuses explicitly on the environmental policy objectives of public procurement. By applying environmental and climate-conscious criteria based on a life-cycle approach to governments' purchasing of goods and services, GPP aims to curtail environmental damage and reduce carbon emissions.[6] The environmental subjects covered by GPP programs generally include climate change, greenhouse gas (GHG) emissions, water conservation, and biodiversity, among others. Notably, in the wake of the Paris Agreement, an increasing number of countries' GPP programs started to emphasize GHG emissions to help limit global warming.[7] Moreover, in the last ten years, GPP has evolved from a "do less harm" approach to a proactive strategy, utilizing public procurement to attain forward-looking environmental goals.[8]

Today, GPP practices are predominantly observed in Europe, North America, and East Asia, where the most innovative and front-runner systems have been developed, even though several countries around the world implement some form of GPP initiative or standard.[9]

Governments are significant buyers of a wide range of goods and services, however, public procurement wields a weightier influence over high-emitting sectors, given the high demand governments have for the construction and transportation industry, and the associated production of core industrial materials like cement, aluminum, and steel.[10]

6 "Green Public Procurement Toolkit," European Commission, https://green-business.ec.europa.eu/green-public-procurement/gpp-training-toolkit_en.

7 Ali Hasanbeigi, Renilde Becqué, and Cecilia Springer, *Curbing Carbon From Consumption: The Role of Green Public Procurement* (San Francisco: ClimateWorks, August 2019), https://www.climateworks.org/wp-content/uploads/2019/09/Green-Public-Procurement-Final-28Aug2019.pdf.

8 *Green Public Procurement: An Overview of Green Reforms in Country Procurement Systems* (Washington, DC: World Bank, 2021), Climate Governance Papers Series, https://openknowledge.worldbank.org/server/api/core/bitstreams/5ee88e6e-a161-58b6-8126-e8a885e3acef/content

9 Cecilia Springer, Ali Hasanbeigi, and Renilde Becqué, *Green Public Procurement and Buy Clean Policies and Programs Around the World* (Washington, DC: American Council for an Energy-Efficient Economy), www.aceee.org/sites/default/files/pdfs/ssi21/panel-4/Springer.pdf.

10 Ali Hasanbeigi, Astrid Nilsson, Gökce Mete, Germain Fontenit, and Dinah Shi, *Fostering Industry Transition Through Green Public Procurement: A "How to" Guide for the Cement & Steel Sectors* (Clean Energy Ministerial, June 2021), https://www.cleanenergyministerial.org/content/uploads/2022/03/fostering-industry-transition-through-green-public-procurement.pdf.

Steel and cement, being among the most carbon-intensive commodities worldwide, account for approximately 14-16% of global energy-related $CO_2$ emissions.[11]

This is where the relevance of GPP comes into focus. GPP has great potential in expediting industrial decarbonization and reshaping hard-to-abate sectors. If the potential of GPP was fully tapped into, it could increase demand for low-carbon commodities such as steel, iron, and cement through their direct offtake. More importantly, through GPP, governments possess the capability to absorb the initial green premium required to propel the technological development cycle and learning effects that will facilitate the eventual cost competitiveness of low-emissions technologies in hard-to-abate sectors compared to conventional means of production. This cost-competitiveness is not possible today due to the large amounts of investment needed to scale production of such radical technological innovations.

Beyond its environmental implications, GPP can also create a significant economic impact. By stimulating the market for the green economy, GPP is expected to catalyze approximately $4 trillion in private sector investment and create circa 3 million net new jobs.[12] This anticipated procurement-driven private investment and new jobs created by GPP will likely increase global GDP by nearly $6 trillion by 2050.[13] Leveraging the potential of GPP, the practices and standards mandated by public procurement could serve as a model for private sector adoption, thereby amplifying the collective impact on industrial decarbonization. The resulting ripple effect across industries could be profound.

# II. Foundational Requirements for Harnessing the Green Public Procurement Potential

While the transformative impact of GPP in decarbonization is evident in theory, harnessing its potential requires a well-structured foundation. Recognizing this necessity, leading institutional groups such as the World Bank, the Industrial Deep Decarbonization Group (IDDI) by the United Nations Industrial Development Organization (UNIDO),[14] and others, have spearheaded efforts to provide structured guidelines and step-by-step recommendations for creating effective GPP frameworks to achieve its ideal role. Their recommendations address several foundational components essential for a robust GPP system, including governance, climate criteria, quantification methods and reporting standards, GPP evaluation tools, and incentives. These recommendations are laid out below.

## A. Governance Framework: Institutions and Targets

A robust governance framework can effectively steer a government's vast purchasing power toward decarbonization goals. Leadership, regulation, coordination, and stringent monitoring are essential components of a GPP robust framework. Central to developing, maintaining and supervising an organizational framework is the **government's institution** vested with the statutory and political authority to take charge of GPP policy and national-level strategy design. As a ministry, department, or an administrative government agency, this entity should lead GPP regulatory development, delegate implementation responsibilities, monitor the progress, and coordinate with other government agencies to ensure that implementation is taking place in the procuring agencies. The central government institution designated for these tasks should have direct control over procurement policy and be engaged in the day-to-day procurement operations.[15]

11 Jamie Atkinson, Sara Dethier, and Kristian Steele, *Industrial Deep Decarbonisation Initiative: Summary of Progress and Outlook* (London: Ove Arup & Partners Ltd., March 2023), https://www.cleanenergyministerial.org/content/uploads/2023/04/iddi-summary-of-progress-and-outlook-2023-v1-0.pdf.

12 Vincent Chin, Michel Fredeau, Harish Hemmige, Joerg Hildebrandt, Pamela Liu, Jim Minifie, Cornelius Pieper, Dave Sivaprasad, Daniel Weise, Eleni Kemene, Yvonne Leung, Jorden Sandstrom, and Renée Van Heusden, *Green Public Procurement: Catalysing the Net-Zero Economy* (Geneva: World Economic Forum, January 2022), www3.weforum.org/docs/WEF_Green_Public_Procurement_2022.pdf.

13 Chin, Fredeau, Hemmige, Hildebrandt, Liu, Minifie, Pieper, Sivaprasad, Weise, Kemene, Leung, Sandstrom, and Van Heusden, *Green Public Procurement.*

14 The IDDI was launched by the Clean Energy Ministerial under the coordination of UNIDO as a global coalition of public and private entities focusing on the creation of lead markets for low-carbon industrial materials including steel, cement, and concrete, advocating for standardized product criteria and carbon assessment methodologies. Moreover, IDDI aims to spur commitment to public procurement of low-carbon steel and cement in at least ten key steel and cement producing countries through a Green Public Procurement Campaign. "Industrial Deep Decarbonisation Initiative," Clean Energy Ministerial, https://www.cleanenergyministerial.org/initiatives-campaigns/industrial-deep-decarbonisation-initiative/.

15 *Green Public Procurement: An Overview of Green Reforms in Country Procurement Systems.*

In order for a GPP system to be effective, it is crucial to set clear quantitative targets. As pointed out before, the process of target setting shoul d be in charge of the government's central GPP body. However, the process should include relevant stakeholder consultation to ensure that complying with those targets is going to be a feasible endeavor for industry actors. The integration of **GPP's targets** should be done following the specific contexts of each jurisdiction as well as the particularities of each industry. Nonetheless, all countries should strive to create SMART targets: specific, measurable, acceptable, realistic, and time-based.[16]

To provide some guidance, IDDI has developed a four-level target system.[17] In this system, **GPP adoption targets** should set the evolution of general procurement procedures of governments becoming progressively greener by including climate criteria in their procurement systems. The industry-level targets focus on fostering industry-specific standards and advancements that are particular to an industry. This usually leverages existing certification schemes and involves either qualifying minimum criteria to benefit from GPP or targets for GPP specific to an industry. An illustration of the latter could include having 50% of cement publicly purchased being certified by the cement and concrete eco-labels delivered by the Concrete Sustainability Council (CSC).[18] **Project-level targets** focus on the environmental impact of a project as a whole, rather than its individual components, by setting a performance threshold for the project's life cycle assessment. **Product-level targets** focus on providing environmental indicators for specific inputs or materials used within a product or project, either as a minimum requirement or as a target (in terms of share of volume of procurement). An illustration of the difference between project-level and product-level targets could be likened to the construction sector's use of performance-based specifications and prescriptive specifications. In the former, the target is set for the entire building based on a given life cycle assessment method, and the contractor may achieve this target in any specific way they choose. In the latter, the concrete used in the building must include a specific percentage of Supplementary Cementitious Materials[19] in the mix to replace high-emitting clinker.

One significant consideration when sculpting the landscape of a GPP system is deciding whether it should be voluntary or mandatory. When targets are voluntary, there is no guarantee that these will actually be used to assess or decide the outcome of the bids for public procurement. Adopting voluntary targets provides more flexibility to address different technology readiness and their specific risks, but leans heavily on the self-motivated effort of both bidder companies and government agencies. On the other hand, a mandatory framework mandates the inclusion of specific environmental targets in government procurement.[20] This distinction underlines the different weights GPP targets can have depending on whether they are voluntary or mandatory in government project bids.

When implementing or reforming GPP practices, it is advisable to introduce mandatory targets initially in a few select categories or industries —typically in central (federal) administrations or specific product lines where technologies are mature and cost-competitive. Voluntary targets, on the other hand, could be applied to industries with higher risks, allowing government agencies to gradually adapt to GPP requirements. As technologies and markets evolve, more categories and industries should transition to mandatory status. While no country has immediately imposed mandatory GPP targets across all procurement areas, there should be ongoing encouragement for all public authorities to progressively adopt these practices and increasingly include more industries and technologies in mandatory targets[21]

16 *Sustainable Public Procurement: How to Wake the Sleeping Giant! Introducing the United Nations Environment Programme's Approach* (Nairobi: United Nations Environment Programme, 2021), https://wedocs.unep.org/bitstream/handle/20.500.11822/37045/SPPWSG.pdf.

17 Hasanbeigi, Nilsson, Mete, Fontenit, and Shi, *Fostering Industry Transition Through Green Public Procurement: A "How to" Guide for the Cement & Steel Sectors,* Annex II.

18 "Certification," Concrete Sustainability Council, https://csc.eco/certification/.

19 "Supplementary Cementing Materials," Portland Cement Association, https://www.cement.org/cement-concrete/concrete-materials/supplementary-cementing-materials.

20 Hasanbeigi, Nilsson, Mete, Fontenit, and Shi, *Fostering Industry Transition Through Green Public Procurement: A "How to" Guide for the Cement & Steel Sectors.*

21 *Green Public Procurement: An Overview of Green Reforms in Country Procurement Systems.*

**Box 1: Financial incentives to spur mandatory adoption of GPP targets in Korea[22]**

The Republic of Korea stands out as one of the limited number of countries that offer financial incentives to their decentralized government agencies for implementing GPP.

In this system, financial rewards are provided to public institutions in the form of annual performance bonuses, which are determined by a ranking system that assesses various indicators including GPP. The GPP evaluation considers the proportion of green purchases relative to the total annual purchases made by the government agency. Government entities with a higher percentage of green purchases achieve better rankings and receive larger bonuses. This has proven to be an effective incentive to increase the mandatory adoption of GPP targets in the country. When first implemented in 2006, the mandatory GPP policy primarily targeted office appliances, furniture, and supplies, which made up over half of the total GPP due to their ease of procurement and monitoring. At that time, building and construction materials had the lowest share of green procurement. Despite a lower GPP rate within this group compared to others, focused government efforts such as these incentives made it possible to increase its share to the largest sector in GPP at 47.9% by 2017.

22 Aure Adell, Bettina Schaefer, and Jae Joon Kim, *Green Public Procurement in the Republic of Korea: A Decade of Progress and Lessons Learned* (Nairobi: United Nations Environment Programme, 2019), https://www.oneplanetnetwork.org/sites/default/files/from-crm/green_public_procurement_in_the_republic_of_korea-_a_decade_of_progress_and_lessons_learned.pdf.

## B. Climate Criteria

**Climate criteria** are the standards and requirements used to classify products and services as "low-carbon" or "green". Such criteria should be rooted in clear definitions that are scientifically based and verifiable. Governments should develop official and standardized criteria for commonly procured items.[23] The institutions in charge of creating the GPP system should ensure the implementation of standardized climate criteria that would provide bidders with certainty and clarity regarding the requirements of the GPP targets. This process of establishing climate criteria should be transparent and include industry and potential bidder participation. In the same line, after the climate criteria is set, it should be equally and promptly communicated to all potential bidders to ensure transparency and fair competition.[24]

Climate criteria design should find a middle ground between environmental efficiency, cost factors, market availability, and ease of verification. They should also focus on the industries, projects, goods, and services that have the greatest climate impact.[25] Climate criteria should permeate all the bidding process stages and be present in the qualification criteria, the technical specifications, the award criteria, and the contract performance criteria of the tender. Finally, climate criteria should be verifiable and the methods for verification should be established in the contract awarded through GPP.[26]

## C. Quantification Methods and Reporting Standards

In order for GPP targets and their embedded climate criteria to be met by potential bidders, a GPP system must establish clear and standardized quantification methods and reporting standards. Unfortunately, in the current GPP landscape, quantification methods and reporting standards are teeming with shortcomings. These deficiencies include inconsistencies, a lack of standardization, and the fact that they are not universally mandated across all product categories. These issues will be discussed in greater detail in the following chapter. For the moment, our attention will turn to the ideal characteristics of these methods and standards, as well as the role they play within GPP.

23 *Green Public Procurement: An Overview of Green Reforms in Country Procurement Systems.*

24 *Sustainable Public Procurement: How to Wake the Sleeping Giant! Introducing the United Nations Environment Programme's Approach.*

25 *Green Public Procurement: An Overview of Green Reforms in Country Procurement Systems.*

26 *Green Public Procurement: An Overview of Green Reforms in Country Procurement Systems.*

Quantification methods are the means and techniques used by potential bidders to measure and estimate the environmental impacts of a product. Currently, the **Life-Cycle Assessment** (LCA)[27] stands as the most accepted method to quantify a product's environmental footprint. LCA poses a comprehensive analysis to measure the embodied carbon of a product by providing a snapshot of a product's environmental impact throughout its entire life span, from production to disposal.

Alongside quantification methods (LCA being the most commonly used one), reporting standards convey the outcome of quantification methods. The leading standard in reporting the quantification of a product's embedded environmental impact is set forth by the ISO 14025 and is defined as **Environmental Product Declaration** (EPD).

EPDs are standardized documents that detail the result of the LCA and indicate embedded emissions of a certain product.[28] To enhance the accuracy of an EPD for a particular product from a specific factory, detailed data specific to the facility and its supply chain is crucial.[29] These documents ideally should aim to streamline the reporting process by offering a structured platform that delineates the environmental impacts in a standardized manner.

To complement the quantification and reporting process, **Product Categories Rules** (PCR) are tailored sets of guidelines on how to conduct an LCA and develop an EPD for a specific product group. These guidelines define how to measure, set boundaries, and make assumptions when creating EPDs, ensuring they are clear and can be compared to find the greenest option. These rules are usually crafted collaboratively by companies, industry associations, and institutions, with input from LCA experts to ensure accuracy.[30]

**Eco-labels**, another commonly used reporting standard, are certifications granted to products meeting specific performance criteria.[31] Eco-labels can serve as a handy reporting standard as they simplify usage by condensing multiple criteria measurements into a single indicator, even though they also have limitations discussed in the following Chapter.

Clearly establishing a quantification method and a reporting standard for specific products as well as creating a database for them can simplify assessments and enhance transparency for government agencies. This allows for information sharing among procurement agencies and simplifies access to environmental data for procurement officers. To ensure that these quantification methods and reporting standards are clear, it is advisable for government entities to adopt and promote within their agencies the use of universally recognized industry-wide product GHG accounting methods and standards, such as the ResponsibleSteel International Standard[32] and the RMI Steel GHG Emissions Reporting Guidance,[33] along with other analogous standards. These frameworks provide a structured approach for measuring and reporting GHG emissions in hard-to-abate industry products, facilitating the alignment of regulatory practices with established industry benchmarks.

## D. Evaluation, Monitoring and Compliance Tools

Effective GPP implementation requires **evaluation tools** that integrate climate criteria into the different sets of targets and the quantification and reporting methods to guarantee transparency and fairness during the evaluation process of the bid. To achieve this, the government institution in charge of GPP design and implementation should create official evaluation guidelines and share them with all potential bidders. These Guidelines should establish the way in which government agencies will incorporate climate criteria into the bid evaluation, the set targets, as well as all of the documentation that bidders will be asked to provide during the bid. A common and helpful way for government agencies to disseminate their evaluation guidelines is through software tools. Currently, most software tools

27 *Environmental Labels and Declarations–Type I Environmental Labelling–Principles and Procedures* (Geneva: International Organization for Standardization, February 2018), https://www.iso.org/standard/72458.html.

28 *Meghan Lewis, Monica Huang, Brook Waldman, Stephanie Carlisle, and Kate Simonen, Environmental Product Declaration Requirements in Procurement Policies: An Analysis of EPD Definitions in Buy Clean and Other North American Procurement Policies* (Seattle: Carbon Leadership Forum at the University of Washington, July 2021), https://carbonleadershipforum.org/epd-requirements-in-procurement-policies/.

29 Hasanbeigi, Nilsson, Mete, Fontenit, and Shi, *Fostering Industry Transition Through Green Public Procurement: A "How to" Guide for the Cement & Steel Sectors.*

30 Lewis, Huang, Waldman, Carlisle, and Simonen, *Environmental Product Declaration Requirements in Procurement Policies.*

31 Hasanbeigi, Nilsson, Mete, Fontenit, and Shi, *Fostering Industry Transition Through Green Public Procurement: A "How to" Guide for the Cement & Steel Sectors.*

32 *ResponsibleSteel International Standard: Version 2.0* (London: ResponsibleSteel, September 2022), https://assets-global.website-files.com/6538e481169ed7220c330f0a/66034300556ac7c2610cd8d0_ResponsibleSteel-Standard-2.0.pdf.

33 Lachlan Wright, Xiyuan Liu, Iris Wu, and Sravan Chalasani, *Steel GHG Emissions Reporting Guidance (Basalt: Rocky Mountain Institute, June 2023),* https://rmi.org/wp-content/uploads/2022/09/steel_emissions_reporting_guidance.pdf.

focus on quantification methods such as carbon footprint calculators and life-cycle costing (LCC) tools.[34] Other tools that could facilitate the evaluation work include environmental criteria checklists that would compile all climate criteria from the bid in an easily accessible format to aid bidders in complying with all requirements and to simplify the government agency's evaluation process. Such checklists could be integrated into the software tools.[35]

34 An example of these tools is the DuboCalc software used in the Netherlands to calculate the sustainability and environmental costs of procurement in the construction sector (discussed more in detail below): "What is DuboCalc?" DuboCalc, https://www.dubocalc.nl/en/what-is-dubocalc/.

35 Hasanbeigi, Nilsson, Mete, Fontenit, and Shi, *Fostering Industry Transition Through Green Public Procurement: A "How to" Guide for the Cement & Steel Sectors.*

**Monitoring** protocols should also be defined by the GPP implementation authority to track the GPP system's impact and contributions to emissions reduction targets as well as the market's response to these new targets. A successful monitoring protocol is threefold and should aim to include self-reported data from the bidders, examination from the relevant government agency and third-party verification. Software tools and e-procurement systems facilitate systematic data collection and reporting for all actors relevant for GPP implementation.[36]

36 *Sustainable Public Procurement: How to Wake the Sleeping Giant! Introducing the United Nations Environment Programme's Approach.*

### Box 2: Software Tools in GPP Monitoring

South Korea stands out as a global pioneer in employing digital procurement systems to facilitate and oversee GPP. The Korean Online E-Procurement System (KONEPS) is the linchpin, overseeing the entire procurement lifecycle, encompassing registration, tendering, contracting, payments, and monitoring. This system interfaces with the Green Product Information Platform, which serves as a repository for GPP data collected from various agencies, subsequently reported to the central monitoring authority, the Korea Environmental Industry and Technology Institute (KEITI). This innovative approach automates the monitoring of all purchases by KEITI, eliminating the need for manual reporting by government agencies. KEITI harnesses the consolidated data to calculate the agency-by-agency and collective reductions in GHG emissions achieved through green procurement, drawing on LCA data.[37]

37 Adell, Schaefer, and Kim, *Green Public Procurement in the Republic of Korea.*

To ensure **compliance** with set GPP targets, enforcement tools are necessary. Examples of these enforcement tools include, but are not limited to, mechanisms such as fines and/or project cancellation. These mechanisms are crucial to tackle negligence from bidders that do not perform or comply with the climate criteria as promised. These enforcement mechanisms should initially be conceived in a robust legal framework and subsequently be included in the template contracts that are awarded to successful bidders to ensure enforcement and effectiveness.[38]

Finally, periodic evaluations of the entirety of the GPP system by the designated central institution are crucial to ensure that the GPP targets remain relevant and to assess its overall impact on GHG emissions reduction. Using this information to update system targets and make adjustments to expand the scope of mandatory GPP can drive further GHG emissions reductions and respond to ongoing technological, market, and policy transformations. As markets evolve, climate criteria for new GPP processes should also adapt to include new and more stringent climate-related standards. It is important to focus GPP targets on industries, projects, and products that significantly impact the climate. However, as these and other sectors evolve in terms of market maturity, technological innovations, and new legal frameworks, so should the GPP climate criteria stay relevant for future GPP processes. Therefore, the central agency managing the GPP system should prioritize a policy-driven approach over rigid regulations to allow

38 Hasanbeigi, Nilsson, Mete, Fontenit, and Shi, *Fostering Industry Transition Through Green Public Procurement: A "How to" Guide for the Cement & Steel Sectors.*

flexibility in implementation and strategies.[39] This periodic and constant evaluation is also necessary to align the government's GPP system and strategies to the country's decarbonization pathway, ensuring that the strategies not only meet current environmental standards but are also forward-looking and innovative. Such evaluations will help in pushing the frontiers of green procurement, thereby supporting the country in achieving its decarbonization goals and fostering a greener economy.

## E. Education and Capacity Building

Creating a GPP reform can be overwhelming and complex for a government as it entails multiple factors to be considered and incorporated into the public procurement process. To support GPP, governments should invest in capacity building and foster peer networks. Trainings and other capacity building resources can educate procurement officers to include environmental criteria in tender documents and evaluate bids based on life cycle impacts, instead of only evaluating them based on the lowest price.[40] In this endeavor, peer networks are essential, as they encourage consistency and cooperation, reducing redundancy and costs through joint procurements.[41]

39 *Green Public Procurement: An Overview of Green Reforms in Country Procurement Systems.*

40 Hasanbeigi, Nilsson, Mete, Fontenit, and Shi, *Fostering Industry Transition Through Green Public Procurement: A "How to" Guide for the Cement & Steel Sectors.*

41 *Green Public Procurement: An Overview of Green Reforms in Country Procurement Systems.*

Furthermore, leveraging existing international resources to avoid reinventing the wheel can be a time saver for governments looking to start a GPP reform. Numerous GPP materials, environmental criteria, cost analysis tools, and implementation guidance are available online and through regional GPP networks. Governments should use them as starting points for their GPP reforms or implementation.[42]

# III. Current Green Public Procurement Landscape

In theory, and provided all the requisites discussed in the previous chapter are perfectly accomplished by governments and bidders, GPP harbors the transformative potential for GHG emissions mitigation, sustainable development, and industrial decarbonization. However, today's GPP landscape presents a contrasting picture,

42 *Sustainable Public Procurement: How to Wake the Sleeping Giant! Introducing the United Nations Environment Programme's Approach;* Liesbeth Casier, Richard Huizenga, Oshani Perera, Marina Ruete, and Laura Turley, *Implementing Sustainable Public Procurement in Latin America and the Caribbean: Handbook for the Inter-American Network on Government Procurement* (Winnipeg: International Institute for Sustainable Development, 2015): https://www.iisd.org/system/files/publications/iisd-handbook-ingp-en.pdf; *Buying Green!: A Handbook on Green Public Procurement* (Luxembourg: European Union, 2016), https://sustainable-procurement.org/fileadmin/user_upload/layout/Documents/Buying-Green-Handbook-3rd-Edition.pdf; Simon Clement, John Watt, and Abby Semple, *The Procura+ Manual: A Guide to Implementing Sustainable Procurement* (Freiburg: ICLEI, 2016), https://procuraplus.org/fileadmin/user_upload/Manual/ManualProcura_online_version_new_logo.pdf.

which is characterized by a fragmented and voluntary approach. Even though many countries around the world implement some kind of GPP policy, central governments often set voluntary targets that are not used by procuring agencies, use accounting methods and standards that are inconsistent, have deficient governance structures, and experience an evident lack of capacity within their agencies to implement robust GPP practices. Therefore, GPP's uptake usually lags behind its envisioned goals and its potential to reduce GHG emissions has not yet been fully unlocked.

## A. Ineffective Award Structures

Public procurement in general and GPP in particular are essentially carried out through two major systems: direct purchases and auction bidding.

**Direct purchase** occurs when an organization directly requests goods and services from a single supplier without undergoing a competitive selection process. This type of public procurement may be appropriate when the value of the goods and services is very low and the competitive process' costs exceed the value of the goods and services, for urgent cases, or when there are ongoing or repeat services.

In the GPP context, direct purchases can be particularly relevant in the context of piloting innovative technologies to introduce and test sustainable practices within a controlled and manageable environment. However, the primary method for awarding public sector contracts typically involves **auctions**, a competitive process that stimulates competition and enhances efficiency by inviting vendors to submit bids for the supply of the same product or service based on public entities' requirements or targets.[43]

Auction bidding can be structured in several different manners. When it comes to GPP, one common way of structuring the bid is through specific target setting (as outlined in chapter 1), which entails setting minimum criteria requirements, such as GHG benchmarks, that potential vendors need to satisfy to be eligible for bidding. While this encourages setting a baseline standard of climate criteria, this strategy presents a substantial risk of awarding of the contract to the most economically viable option among the qualified bidders, thereby limiting the scope to further differentiate and incentivize vendors based on their different contributions to climate mitigation.

On the other hand, **preferential buying**[44] is a form of public procurement commonly used in GPP, where bid preferences are implemented by applying a discount to the bids of companies that meet specific environmental criteria, solely for evaluation purposes. Doing this effectively lowers their bid prices, giving them a competitive advantage, yet the winning bidder is awarded the contract at the original bid price. This form of procuring promotes the competitiveness of low-carbon products or services and facilitates their integration into the market. The value of the bid discount is relevant; a discount that is too low may not provide sufficient incentive for bidders to participate when considering the elevated costs associated with preparing for this type of bidding process. Developing a model that determines the optimal discount level to effectively influence bidder behavior presents a significant challenge that governments must be prepared to address.[45]

While an array of GPP tools and models are available and often used in public procurement, the stark reality remains that current GPP implementation is not sufficiently geared towards fostering the acquisition of low-carbon products and still possesses certain deficiencies in its framework and mechanisms. For instance, while public procurement is gradually shifting from the lowest cost possible to the "best value-for-money," not all jurisdictions have clarified the meaning of it, the extent to which it goes beyond cost concerns, and what systematic approach to adopt to make GPP rigorous and impactful for the low-carbon transition.[46]

## B. A Voluntary System

As of today, GPP practices adoption are predominantly voluntary across most countries and regions, including those that are at the forefront of GPP practices such as the European Union (EU).

43 Panos L. Lorentziadis, "Auction Systems and Public Procurement," in *Global Encyclopedia of Public Administration, Public Policy, and Governance* (New York: Springer Publishing, 2020), https://doi.org/10.1007/978-3-319-31816-5_4096-1.

44 Chris Bataille, *Low and Zero Emissions in the Steel and Cement Industries: Barriers, Technologies, and Policies* (Paris: OECD, November 2019), https://www.oecd.org/greengrowth/GGSD2019_IssuePaper_CementSteel.pdf.

45 Xiaoyu Liu and Qingbin Cui "Assessing the Impacts of Preferential Procurement on Low-Carbon Building," *Journal of Cleaner Production* 112 (2019): 863–871, https://doi.org/10.1016/j.jclepro.2015.06.015.

46 Nicole Darnall, Justin M. Stritch, Yifan Chen, Angela Fox, Jake Swanson, Aure Adell, Jellie Molino, Agnes Wierzbicki, Luc Bres, Marzia Angela Cremona, Anne-Marie Saulnier, Martin Dumas, Ouiam Outmani, and Roberto Caranta, *Sustainable Public Procurement 2022 Global Review: Part I. Current State of Sustainable Procurement and Progress in National Governments* (Paris: United Nations Envrionment Programme, 2022), https://www.oneplanetnetwork.org/sites/default/files/from-crm/300_I_UNEP_Global_Report_2022.pdf.

## Box 3: Green Public Procurement Practices and Requirements in the EU

Within the EU, GPP remains largely voluntary for all public authorities. Targets and criteria for GPP are set by sector-specific product groups and each set of targets emphasizes in its introductory section that they are voluntary and formulated as a way of guiding the individual authority into integrating them into their tender documents, only if they deem it appropriate.[47]

While GPP targets and criteria are voluntary, there are certain sector-specific legal requirements in the EU legislation that are mandatory for all procurers.[48] These include criteria for clean vehicles, energy efficiency and energy performance of buildings. The EU Directives for these sectors comprise GPP targets that are mandatory for procurers across the region.[49]

Typically, member states adhere to minimum legal requirements set out by EU Directives and rarely exceed the base compliance obligations. As a result, the implementation of GPP across the EU (as of 2023) still falls short of its past target to have 50% of all public procurement meeting the core EU GPP criteria by 2010, given that even today that percentage has not yet been achieved.[50] Moreover, there are no publicly disclosed schedules for the introduction and execution of mandatory GPP targets.

47 European Commission, EU GPP Criteria for Indoor Cleaning Services, SWD(2018) 443, October, 11, 2018, https://circabc.europa.eu/ui/group/44278090-3fae-4515-bcc2-44fd57c1d0d1/library/c9b70f95-939c-464d-8107-d43cdb59d55a/details.

48 "Green Public Procurement Criteria and Requirements," European Commission, https://green-business.ec.europa.eu/green-public-procurement/gpp-criteria-and-requirements_en.

49 European Parliament and Council of the European Council, EU Directive 2018/844 Amending Directive 2010/31/EU on the Energy Performance of Buildings and Directive 2012/27/EU on Energy Efficiency, May 30, 2018, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L0844&from=IT.

50 Astrid Nilsson Lewis, Kaidi Kaaret, Eileen Torres Morales, Evelin Piirsalu, and Katarina Axelsson, *Green Public Procurement: A Key to Decarbonizing Construction and Road Transport in the EU* (Stockholm: Stockholm Environment Institute, February 2023), https://www.sei.org/wp-content/uploads/2023/02/green-public-procurement-eu.pdf

Globally, only a handful of countries have established mandatory GPP targets, and these vary significantly in scope, with most countries enforcing these mandates in limited areas.

**Box 4: Some Examples of Mandatory GPP Practices**

- As of 2023, Italy[51] is one of the few countries that has wide-ranging mandatory targets at all levels of government.
- As of 2019, Germany and Japan[52] only required mandatory GPP practices at the federal level.
- As of 2023, Estonia's GPP practices are only mandatory for four product groups at the national level.[53]
- The United States[54] initiated mandatory targets for concrete and asphalt at the federal level in 2022.

51 Lewis, Kaaret, Morales, Piirsalu, and Axelsson, *Green Public Procurement: A Key to Decarbonizing Construction and Road Transport in the EU.*
52 Springer, Hasanbeigi, and Becqué, *Green Public Procurement and Buy Clean Policies and Programs Around the World.*
53 Lewis, Kaaret, Morales, Piirsalu, and Axelsson, *Green Public Procurement: A Key to Decarbonizing Construction and Road Transport in the EU.*
54 "Facilities Standards (P100) Overview," United States General Services Administration, https://www.gsa.gov/real-estate/design-and-construction/engineering/facilities-standards-for-the-public-buildings-service.

This landscape evidences that typically, mandatory practices and targets are implemented when technologies are more mature and cost-competitive, presenting fewer risks to procurers. Conversely, voluntary practices are often applied to nascent technologies that are perceived as higher risk due to their early development stage. As we mentioned in chapter 2, over time, targets or practices that started as voluntary should evolve to become mandatory, as the technologies and markets mature and their commercial adoption increases.

## C. A Convoluted Structure

The GPP landscape is highly convoluted. First, current procurement programs vary in scope. Many "green" public procurement programs are still operated under the umbrella of sustainable public procurement, where the climate perspective is not emphasized but interwoven with other economic and social considerations. Even though recent data from UNEP shows a growing emphasis on climate mitigation and several other environmental topics in countries' Sustainable Public Procurement practices, a collective consensus to separate GPP from SPP and give special relevance to more targeted climate mitigation of low-carbon factors seems to be missing.[55]

55 Darnall, Stritch, Chen, Fox, Swanson, Adell, Molino, Wierzbicki, Bres, Cremona, Saulnier, Dumas, Outmani, and Caranta, *Sustainable Public Procurement 2022 Global Review,* (p. 11-13).

## Box 5: UNEP's Sustainable Public Procurement Global Review (2022)[56]

The Sustainable Public Procurement Global Review is informed by an online survey of 322 sustainable purchasing stakeholders working at international organizations, local public authorities, companies, non-profits, or as consultants. It was also complemented by a national government questionnaire that assessed sustainable public procurement practices administered by 45 national governments. 76% of the UNEP's survey participants regarded environmental factors, including natural resource preservation, pollution reduction, and biodiversity as highly important in their organization's activities. However, the same number granted a high level of importance to economic factors, such as supporting local suppliers, small and medium-sized enterprises (SMEs), fostering innovation, ensuring fair practices, preventing corruption, and avoiding dumping. Slightly fewer, at 70%, emphasized the significance of social factors, including diversity, equality, human and labor rights, and health and safety in their work. These findings evidence that the concept of Sustainable Public Procurement encompasses a broader range of social and economic considerations as relevant for governments as the environmental considerations, thus targeted actions towards GHG emissions reductions and other climate-related factors still fall short.

56 Darnall, Stritch, Chen, Fox, Swanson, Adell, Molino, Wierzbicki, Bres, Cremona, Saulnier, Dumas, Outmani, and Caranta, *Sustainable Public Procurement 2022 Global Review.*

The lack of clarity is not limited to the general scope of GPP but also permeates the environmental criteria, especially GHG emissions data, if available.[57] In Estonia, the absence of a unified GPP framework allows individual procurers to set their own environmental criteria, deciding on their own what constitutes a "green" product.[58] Only a few countries, notably Netherlands and Sweden,[59] have both a clear GPP scope and well-defined environmental criteria. Yet, in these countries, climate or GHG emission criteria often get overshadowed by a broader set of environmental considerations such as waste minimization and collection, local pollution and biodiversity, among others.[60] This results in these countries having to prioritize other environmental criteria over emissions reductions, perpetuating the lack of clarity and standardization in GPP practices.

Moreover, duties related to public procurement are scattered across multiple ministries and agencies, making it difficult to ascertain clear lines of accountability for GPP practices. It is rare for a country to have a central procurement agency providing one-stop guidance for all levels of implementation. Instead, a more common scenario involves a coalition of agencies managing different aspects of public procurement.[61] While national governance generally resides within the Ministry of Environment or the Ministry of Finance, sub-national policies can vary greatly (done by various agencies) within the same country. Regional and local agencies have high flexibility to establish or select their own GPP practices and targets in countries such as Germany, Spain, and Sweden.[62] Sub-national governments, being potentially too small for substantial investments, face challenges in attracting attention and scale. Limited resources often lead them to prioritize administratively simple and economically "low-cost" solutions, potentially limiting the ambition

57 Hasanbeigi, Becqué, and Springer, *Curbing Carbon From Consumption: The Role of Green Public Procurement.*

58 Lewis, Kaaret, Morales, Piirsalu, and Axelsson, *Green Public Procurement: A Key to Decarbonizing Construction and Road Transport in the EU.*

59 Lewis, Kaaret, Morales, Piirsalu, and Axelsson, *Green Public Procurement: A Key to Decarbonizing Construction and Road Transport in the EU.*

60 Darnall, Stritch, Chen, Fox, Swanson, Adell, Molino, Wierzbicki, Bres, Cremona, Saulnier, Dumas, Outmani, and Caranta, *Sustainable Public Procurement 2022 Global Review.*

61 Lewis, Kaaret, Morales, Piirsalu, and Axelsson, *Green Public Procurement: A Key to Decarbonizing Construction and Road Transport in the EU.*

62 Lewis, Kaaret, Morales, Piirsalu, and Axelsson, *Green Public Procurement: A Key to Decarbonizing Construction and Road Transport in the EU.*

of GPP processes.[63] Maintaining decentralized systems such as these, fosters flexible local adaptation but poses challenges in terms of lacking foundational harmonized GPP rules, hampering inter-agency coordination (including at the budgetary level), which should not go unaddressed when striving to ramp-up GPP.

## D. Lack of Capacity

The most widespread barrier across different jurisdictions in implementing a robust GPP system is related to information, training and capacity development.[64] Lack of awareness regarding GPP and its potential financial and environmental advantages, coupled with limitations in human and financial resources for GPP program implementation or reform, present significant challenges for governments across the world.[65]

Various jurisdictions such as China and Korea have reported that their government procurement agencies suffer from a systematic lack of knowledge and information about GPP and its financial and environmental benefits.[66] In the European Union region, procurer agencies' personnel often must undergo training to become acquainted with low-carbon or green options in the market and develop innovative procurement methods. These trainings entail a budget allocation that can pose obstacles for GPP uptake for some countries. Given that GPP is nascent in most countries, procurement professionals must demonstrate enhanced expertise, dedication, and effort to explore novel approaches in their roles.[67]

Furthermore, the perception that "green" products or services are more expensive often operates as a barrier for GPP targets to be adopted in government procurement. "Green" production methods generally entail incremental costs in capital (and often also operating) expenditures of producer companies, which make the output product more expensive than its conventional counterpart (this will be discussed in more detail in Chapter 3). Even though this is objectively true, it is also important to consider that when analyzing the costs of both production methods, traditional products appear less expensive because the additional externalities (social and environmental costs) are not shouldered by purchasing entities and suppliers but by society at large. Procurement agencies are not usually trained to understand that basing procurement decisions solely on the lowest offering price, as opposed to considering the entire life-cycle cost of the product or service, can negatively impact the probability of choosing low-carbon or green products and services. Integrating environmental considerations into procurement, through methods such as the Most Economically Advantageous Tender (MEAT) principle, is crucial for government agencies to appreciate and uphold the principle of pricing externalities, rather than merely pursuing the lowest cost (see further discussion in Chapter 3).[68]

## E. Unstandardized Accounting and Reporting

A multitude of quantification methods and reporting standards have emerged to assess environmental impact. However, these tools often rely on varying assessment standards, leading to disparities in outcomes and interpretations. When evaluating the environmental impact, differentiation arises not only from the diverse accounting methods but also from the myriad ways in which this information is reported.

### 1. Quantification Methods or Accounting:

LCA is a popular methodology in today's GPP landscape. As mentioned before, governed by the ISO standard 14040, LCA offers a framework to measure the environmental impact of products within specific scopes and life cycles. LCA is a valuable tool but has inherent drawbacks. For instance, there is a notable variability in how LCAs are conducted in practice. While this standard sets helpful foundational principles in theory, the inherent flexibility of ISO 14040 has led to a multitude of product-specific accounting methods. For one particular kind of product, there are multiple applicable accounting methods available based on LCA.

63 Oliver Sartor and Chris Bataille, *Decarbonising Basic Materials in Europe* (Paris: IDDRI, October 2019), https://www.iddri.org/en/publications-and-events/study/decarbonising-basic-materials-europe.
64 Lewis, Kaaret, Morales, Piirsalu, and Axelsson, *Green Public Procurement: A Key to Decarbonizing Construction and Road Transport in the EU.*
65 Hasanbeigi, Becqué, and Springer, *Curbing Carbon From Consumption: The Role of Green Public Procurement.*
66 Hasanbeigi, Becqué, and Springer, *Curbing Carbon From Consumption: The Role of Green Public Procurement.*
67 Lewis, Kaaret, Morales, Piirsalu, and Axelsson, *Green Public Procurement: A Key to Decarbonizing Construction and Road Transport in the EU.*
68 Darnall, Stritch, Chen, Fox, Swanson, Adell, Molino, Wierzbicki, Bres, Cremona, Saulnier, Dumas, Outmani, and Caranta, *Sustainable Public Procurement 2022 Global Review.*

For instance, steel—a key product to unlock the GPP potential— could employ several distinct accounting methods such as the ISO 14404 series, WorldSteel standard, GHG Protocol Iron and Steel, IPCC guideline (2019), or EU ETS taxonomy. These methods vary in scope boundaries, with some concentrating on on-site emissions and others expanding to off-site emissions. Furthermore, the GHG emissions included in the calculation vary among these standards: certain methods track only CO2, while others encompass a broader spectrum, including CH4, N2O, and HFC/PFC/SF6[69]. Additionally, beyond internationally recognized methods like the ISO standards (used by both the public and private sector), individual countries also have developed their own LCA methods such as PAS 2050 by the UK[70], the BP X30-323 by France[71], Eco-lead Environmental Labeling Program by Japan[72], among others. The diverse array of quantification methodologies available for assessing the environmental footprint of a single product, each potentially yielding distinct outcomes, poses a considerable challenge in establishing a consistent and standardized GPP system. This variation allows bidders to potentially select any result that aligns with their convenience, leading to questions about the acceptable level of accuracy and uncertainty and thereby complicating the creation of a uniform GPP framework.[73]

### 2. Reporting Standards:

At the same time, the market witnesses a proliferation of different reporting mediums that each communicate products' environmental impact in the market.

Eco-labels serve as key indicators to highlight products as being environmentally friendly. While seemingly straightforward, Eco-labels often conflate diverse environmental, social, and governance (ESG) data into a singular metric. Such an approach obfuscates consumers to differentiate between products that just scrape through the minimum requirements and those that truly excel.[74] The surge in the variety of eco-labels, both nationally created and those by NGOs or private entities, further muddies the waters. Though adhering to the ISO 14024 standard, many Eco-labels like the EU Eco-label and the Blue Angel still manifest certain variations due to different criteria.[75] [76]

Another available reporting medium is environmental claims, which could be self-assessed or vetted by third parties. These assessments, highly unstandardized, oscillate between rudimentary, self-made checklists and in-depth self-declared claims adhering to the ISO 14021 standards.[77] [78]

Finally, EPDs, as explained before, appear to be a standardized medium to communicate the environmental impact as determined by LCA. However, due to the lack of consistency and inadequate design guidance of LCA, the effectiveness of current EPDs is diminished, lacking accurate measurement methods and harmonized reporting standards of carbon emissions. Similarly, the inconsistent and sometimes poorly designed PCRs undermine the comparability of EPDs, even for products within the same category following the same PCR.[79]

69 John Biberman, Perrine Toledano, Baihui Lei, Max Lulavy, and Rohini Ram Mohan, *Conflicts Between GHG Accounting Methodologies in the Steel Industry* (New York: Columbia Center on Sustainable Investment, December 2022), https://ccsi.columbia.edu/sites/default/files/content/docs/publications/ccsi-comet-conflicts-ghg-accounting-steel-industry.pdf.

70 *Specification for the Assessment of the Life Cycle Greenhouse Gas Emissions of Goods and Services* (London: BSI, September 2011), https://knowledge.bsigroup.com/products/specification-for-the-assessment-of-the-life-cycle-greenhouse-gas-emissions-of-goods-and-services?version=standard.

71 Sylvain Chevassus, *French Developments on Product Environmental Footprint Display* (Paris: French Ministry of Ecology, Sustainable Development, and Energy, February 2013), https://circabc.europa.eu/sd/a/14a0a70f-0fc1-444d-9043-5c90b44f9855/France%20Environmental%20Footprint.pdf.

72 "EcoLeaf Environmental Label," EcoLeaf, http://www.ecoleaf-jemai.jp/eng/.

73 Sara Toniolo, Lorenzo Borsoi, Daniela Camana, "Chapter 7 - Life Cycle Assessment: Methods, Limitations, and Illustrations," in *Methods in Sustainability Science* (Amsterdam: Elsevier, 2021), p. 105-118, https://doi.org/10.1016/B978-0-12-823987-2.00007-6.

74 Hasanbeigi, Nilsson, Mete, Fontenit, and Shi, *Fostering Industry Transition Through Green Public Procurement: A "How to" Guide for the Cement & Steel Sectors.*

75 "Basic Award Criteria," The German Ecolabel, https://www.blauer-engel.de/en/certification/basic-award-criteria.

76 "Product Groups and Criteria: Discover the Full Range of EU Ecolabel Products and Criteria," European Commission, https://environment.ec.europa.eu/topics/circular-economy/eu-ecolabel-home/product-groups-and-criteria_en.

77 Biberman, Toledano, Lei, Lulavy, and Ram Mohan, *Conflicts Between GHG Accounting Methodologies in the Steel Industry.*

78 ISO, 14021 Type II environmental labels: Type II denotes independently stated environmental assertions, essentially statements that aren't supported by external certifications like ecolabels. ISO 14021 establishes a set of guidelines that manufacturers should follow when presenting their own environmental statements.

79 M.D.C. Gelowitz and J.J. McArthur, "Comparison of Type III Environmental Product Declarations for Construction Products: Material Sourcing and Harmonization Evaluation," *Journal of Cleaner Production* 157, (2017): 125–133, https://doi.org/10.1016/j.jclepro.2017.04.133.

To address these issues, global efforts are underway to refine the existing criteria and establish PCR guidance. Leading the movement are several international organizations, initiatives and countries including the United Nations (UN), IEA, the United States, and Japan.
The International Energy Agency (IEA) proposed definitions for low-carbon and near-zero emission products in steel and cement, aligning with the scenario to reach net-zero by 2050.[80] Adopting these definitions, IDDI has recognized the pivotal role of EPDs and LCAs in standardizing reporting and defining GHG intensity levels.[81]

80 *Achieving Net Zero Heavy Industry Sectors in G7 Members* (Paris: International Energy Agency, May 2022), https://www.iea.org/reports/achieving-net-zero-heavy-industry-sectors-in-g7-members.

81 Atkinson, Dethier, and Steele, *Industrial Deep Decarbonisation Initiative.*

A cornerstone of IDDI's strategy is the rigorous refinement of PCR Calculation methodologies. This refinement is three-pronged: a precise definition of individual product stages in the value chain (e.g., crude steel to cold-rolled steel), the establishment of clear boundaries and thresholds for each stage with clarity on scope 3 emissions, and an unwavering commitment to data quality. The IDDI champions the use of facility-specific data in EPDs to guarantee accurate embodied carbon figures. Calculations should remain consistent across the entire product life cycle.[82]

82 Atkinson, Dethier, and Steele, *Industrial Deep Decarbonisation Initiative.*

**Box 6: Efforts for Standardization and Harmonization of EPDs and PCRs**

In the US, significant strides have been made towards creating standardized methodologies and criteria for EPDs, especially after the enactment of the Inflation Reduction Act (IRA). Rapid policy development and funding deployment are happening under the IRA, including the recently introduced US Buy Clean Task Force. Introduced at the federal level, this policy aims to prioritize the purchase of low-carbon materials in infrastructure and construction at the federal level.[83] Three key objectives of the Buy Clean Task Force include 1) identifying steel, concrete, asphalt, and flat glass as key materials for consideration in federal procurement and projects, 2) enhancing the transparency of embodied emissions through improved supplier reporting, 3) launching pilot projects to prioritize and expand public procurement of low-carbon materials in federally-funded projects.[84]

In March 2022, the U.S. General Services Administration (GSA) issued its inaugural "Buy Clean" standards for concrete and asphalt.[85] These standards mandate suppliers to furnish EPDs. As the initiative evolves, it narrows its focus on key materials: steel, concrete, asphalt, and flat glass. Even though the initiative is in its early stages, it is emphasizing stringent requirements on standards. The initiative relies on EPDs as its primary data source and reporting standard for suppliers. There's a continuous effort to refine and bolster EPDs and PCRs and sub-category PCRs.[86] Moreover, section 60112 of the IRA provides $350 million to the Environmental Protection Agency (EPA) to develop an EPD Assistance Program to "support the development,

83 Office of the White House, "Fact Sheet: Biden-Harris Administration Announces New Buy Clean Actions to Ensure American Manufacturing Leads in the 21st Century," press release, September 15, 2022, https://www.whitehouse.gov/briefing-room/statements-releases/2022/09/15/fact-sheet-biden-harris-administration-announces-new-buy-clean-actions-to-ensure-american-manufacturing-leads-in-the-21st-century/.

84 *GSA Low-Embodied Carbon Projects – Industry Fact Sheet (Washington, DC: General Services Administration, November 2023),* https://www.gsa.gov/system/files/Final-LEC-Projects-Plan-Factsheet_110323.pdf.

85 United States General Services Administration, "GSA Lightens the Environmental Footprint of Building Materials," press release, March 30, 2022, https://www.gsa.gov/about-us/newsroom/news-releases/gsa-lightens-the-environmental-footprint-of-its-building-materials-03302022.

86 Ali Hasanbeigi, Dinah Shi, and Harshvardhan Khutal, *Federal Buy Clean Policy for Construction Materials in the United States* (Washington, DC: American Council for an Energy-Efficient Economy), https://www.aceee.org/sites/default/files/pdfs/ssi21/panel-4/Shi.pdf.

enhanced standardization and transparency and reporting criteria for environmental product declarations and reporting criteria for environmental product declarations."[87]

In Europe, the European Commission has developed the Product Environmental Footprint (PEF) and Organization Environmental Footprint (OEF) methods,[88] as a general approach to calculate environmental impacts based on standardized LCA methodology. Within it, the Commission introduced the Product Environmental Footprint Category Rules (PEFCR), rulesets for specific product groups to facilitate the comparison of environmental performance across the EU market. However, these methods remain as voluntary recommendations under a transition phase that aims to achieve the mandatory adoption of these policies by 2024. Moreover, the comparability remains limited, and PEFCR exists only for certain product groups.[89]

At the Asian front, Japan is enhancing guidelines surrounding the Carbon Footprint of Products (CFP),[90] which encompasses GHG emissions across the product value chain. Released in 2023, these new guidelines aim to be industry-specific[91] and adhere to the standards set in ISO 14025 and ISO 14067.

87 "Inflation Reduction Act Programs to Fight Climate Change by Reducing Embodied Greenhouse Gas Emissions of Construction Materials and Products," Environmental Protection Agency, https://www.epa.gov/inflation-reduction-act/inflation-reduction-act-programs-fight-climate-change-reducing-embodied.

88 "Environmental Footprint Methods," European Commission, https://green-business.ec.europa.eu/environmental-footprint-methods_en.

89 Lewis, Kaaret, Morales, Piirsalu, and Axelsson, *Green Public Procurement: A Key to Decarbonizing Construction and Road Transport in the EU.*

90 "Report of the Study Group on Calculation and Verification of Carbon Footprint for Carbon Neutrality in the Entire Supply Chain," Ministry of Economy, Trade, and Industry, March 31, 2023, https://www.meti.go.jp/shingikai/energy_environment/carbon_footprint/20230331_report.html.

91 Ministry of Economy, Trade and Industry, "'Carbon Footprint Report'" and "'Carbon Footprint Guidelines'" Compiled," press release, March 31, 2023, https://www.meti.go.jp/english/press/2023/0331_005.html.

Striving towards this type of harmonization and standardization in EPDs and PCRs is key to provide an underlying solid foundation for GPP targets and systems to unlock its potential in achieving decarbonization goals.

## IV. Innovative Green Public Procurement Systems

Governments hold a unique position to leverage GPP as a dynamic tool to pioneer decarbonization efforts, particularly in hard-to-abate sectors. By using GPP in innovative ways, governments can set ambitious, forward-looking targets that spur the development and adoption of nascent technologies aimed at decarbonizing these sectors. This proactive use of GPP serves to catalyze the market towards emergent solutions that might otherwise languish in the developmental phase due to lack of commercial incentive or perceived risk.

The approach outlined in the previous chapter taken currently by governments of merely setting voluntary targets and passively waiting for decarbonization technologies to mature is insufficient to accelerate the development and uptake of these technologies at the necessary pace. Therefore, it is imperative for governments to employ GPP in a more proactive way, transforming it into a mechanism that not only drives the market towards sustainability through effective incentives but also pioneers the use of innovative procurement tools. These tools should be designed to bridge the gap between current practices and the GPP theoretical potential in driving industrial decarbonization.

Recent strides in this direction are showing how innovative ways of implementing GPP help reconcile cost considerations while steering procurement strategies towards low-carbon solutions. The implementation of mechanisms like the $CO_2$ Performance Ladder and Carbon Contracts for Difference demonstrate tangible successes, showcasing practical approaches to integrating decarbonization and climate criteria into procurement processes. This chapter will provide an overview of these mechanisms, highlighting their roles and success in achieving cost-effectiveness for both public and private stakeholders, while supporting nascent decarbonization technologies in hard-to-abate sectors through low-carbon procurement.

## A. $CO_2$ Performance Ladder

In the evolving landscape of GPP, the Netherlands emerges as a frontrunner in GPP practices. Since its initial commitment to green initiatives in 2005,[92] the Netherlands has been promoting the development of robust GPP evaluation tools like the DuboCalc accounting software and the Environmental Cost Indicator (ECI). Among these tools, the $CO_2$ Performance Ladder ($CO_2$PL) stands out as a comprehensive certification system that can be used as both a $CO_2$ management and reporting system as well as a procurement tool based on bid discount.

### 1. The Development of $CO_2$PL

$CO_2$PL was created by the Dutch railway sector through ProRail in 2009. Today, and since 2011, this tool is owned and managed by the Netherlands-based Nonprofit, SKAO (Foundation for Climate-Friendly Procurement and Business).[93] In 2011, SKAO released the $CO_2$PL Handbook 2.0, aligning with European procurement regulations. Subsequently, they have periodically published updated handbooks, incorporating research-driven enhancements. The latest update available is the Handbook 3.1, published in 2020. The $CO_2$PL has been used in GPP processes on a voluntary basis in the Netherlands since 2010.[94]

With over a decade of implementation experience, the $CO_2$PL is currently employed both as a carbon management system and as a GPP tool (each discussed in more depth below), with favorable results in both arenas. As a carbon management system, the $CO_2$PL has certified around 4,000 companies operating in the Netherlands.[95] Over 300 Dutch public procuring authorities have successfully used the $CO_2$PL in GPP processes across different sectors including infrastructure, energy production, and manufacturing, among others.[96] Moreover, a 2016 study surveyed companies in the civil engineering sector on the impacts of the $CO_2$PL and showed that the potential competitive advantage in procurement contracts was the primary driver for companies to adopt the $CO_2$PL and improve their energy and carbon management practices.[97]

### 2. $CO_2$PL: A Carbon Management System

This tool helps deploy a carbon management system to guide organizations in refining internal procedures to save energy, reduce $CO_2$ emissions, prepare sustainability reports emphasizing $CO_2$, discover innovation and collaboration opportunities, and cut costs tied to carbon emissions. Unlike setting specific emission thresholds, the $CO_2$PL employs the Plan-Do-Check-Act cycle, emphasizing continuous improvement for organizations aiming to reduce carbon or achieve carbon neutrality. Certified organizations must gradually enhance their understanding of carbon emissions, implement reduction efforts, communicate about their initiatives, and engage with their industry and supply chain.

CE Delft's 2023 research found that the $CO_2$PL is responsible for 3% additional annual emissions reduction for Scope 1 and 2.[98] In the same line, municipalities implementing the CO2PL achieved a 23.9% reduction in $CO_2$ emissions between 2018 and 2020 (12.8% per year) shortly after obtaining $CO_2$PL certification. Most of these reductions occurred in Scope 1.[99] Furthermore, obtaining a CO2PL certification has allowed companies to evidence their low-carbon initiatives both within and outside the organization.[100]

92 Hasanbeigi, Becqué, and Springer, *Curbing Carbon From Consumption: The Role of Green Public Procurement.*

93 Ronja Bechauf, Laura Turley, and Liesbeth Casier, The $CO_2$ Performance Ladder as a Tool for Low-Carbon Procurement: A Feasibility Study for 10 European Countries (Winnipeg: IISD, March 2023), https://www.iisd.org/system/files/2023-03/co2-ladder-tool-low-carbon-procurement.pdf.

94 Bechauf, Turley, and Casier, *The $CO_2$ Performance Ladder as a Tool for Low-Carbon Procurement: A Feasibility Study for 10 European Countries.*

95 Ellen Schep, Amanda Bachaus, Marijn Bijleveld, and Martha Deen, *Evaluation of the $CO_2$ Performance Ladder: Existing Literature and Data Review* (Delft: CE Delft, June 2022), https://ce.nl/wp-content/uploads/2022/11/CE_Delft_210479_Evaluation_Perfomance_Ladder_DEF.pdf.

96 Bechauf, Turley, and Casier, *The $CO_2$ Performance Ladder as a Tool for Low-Carbon Procurement: A Feasibility Study for 10 European Countries.*

97 Martijn G. Reitbergen, Ivo J. Opstelten, and Kornelis Blok, "Improving Energy and Carbon Management in Construction and Civil Engineering Companies: Evaluating the Impacts of the $CO_2$ Performance Ladder," Energy Efficiency 10, (2017): 55–79, https://doi.org/10.1007/s12053-016-9436-9.

98 This was calculated based on the CE Delft's survey's yearly average reduction of 7.7% and the highest additional reduction measure of 15-46%. However, total $CO_2$ reduction figures are not available because there was no standardized database on companies' emissions available during the study.

99 Schep, Bachaus, Bijleveld, and Deen, *Evaluation of the $CO_2$ Performance Ladder: Existing Literature and Data Review.*

100 Bechauf, Turley, and Casier, *The $CO_2$ Performance Ladder as a Tool for Low-Carbon Procurement: A Feasibility Study for 10 European Countries.*

A $CO_2PL$ certificate is available on five different levels. The ranking is based on the performance of organizations in four pivotal aspects: insight, reduction, transparency, and participation. In order to get certified from levels 1 to 3, only Scope 1 and 2 $CO_2$ emissions are accounted for. For higher levels (levels 4 and 5) Scope 3 emissions are also mandatory to obtain a certification.

**Table 1. Four pivotal areas across five certification levels of $CO_2PL$[101]**

| Area | Description | Achievements per level |
|---|---|---|
| Insight | Organizations seeking certification are expected to provide insights into their energy consumption patterns and carry out an energy assessment. | Levels 1 and 2: charting out the energy types and sources.<br>Level 3: quantifying the energy use in CO2 equivalent emissions across Scope 1 and 2.<br>Levels 4 and 5: report on Scope 3 emissions. |
| Reduction | The certification requires organizations to construct ambitious $CO_2$ reduction strategies. | Levels 1 and 2: focus on scrutinizing potential avenues for energy savings and setting precise targets.<br>Level 3: incorporate a quantified management action plan for their own organization.<br>Levels 4 and 5: set up quantifiable actions extending to Scopes 1, 2, and 3 emissions. |
| Transparency | This segment requires organizations to report and disseminate their CO2 emissions reduction plan and the progress therein. | Levels 1 and 2: focus on internal communication.<br>Level 3: communicate externally.<br>Levels 4 and 5: initiate dialogue with government agencies and make public pledges to carbon reduction plans. |
| Participation | This area encourages collaboration and knowledge sharing. | Levels 1 and 2: organizations are urged to join and align with sector-specific initiatives.<br>Levels 3 and 4: transition into active engagement in CO2 emission reduction initiatives.<br>Level 5: partner with public sector or nonprofits in their sectors. |

101 Adapted from: *Practical Manual: How Do You Use the $CO_2$ Performance Ladder?* (Utrecht: SKAO, November 2021), https://www.co2-prestatieladder.nl/en/practical-manual.

Certified entities undergo an annual audit by an accredited third-party body, covering the four categories and verifying $CO_2$PL effectiveness. Continuous yearly improvement is assessed, and there are general requirements, including internal audits, management reviews, and documentation maintenance.[102]

### 3. $CO_2$PL: Green Public Procurement Application

As a green procurement tool, $CO_2$PL builds upon the preferential buying mechanism in which procurers give favored treatment to companies with better carbon management by granting an Award Advantage during the evaluation stage in the form of additional points, or by providing fictitious bid discounts on their original bid price. As a GPP tool, the $CO_2$PL serves as a mechanism to reward certified companies actively addressing climate concerns and assists them in securing public contracts.

The $CO_2$PL is used as a voluntary assessment criterion in procurement processes. It allows contracting authorities to grant advantages to companies actively reducing carbon emissions. This can include extra points or a hypothetical reduction in bid prices. Contracting authorities use $CO_2$PL to increase the chances of environmentally responsible companies winning public contracts. The bidder specifies the ambition level (one of the 5 ladder levels) on the $CO_2$ performance ladder at which they plan to execute the project, with higher levels indicating greater efforts to reduce emissions, resulting in a higher chance of winning the contract and a larger deduction from the submission price.[103] The advantage granted varies with the company's performance level on the $CO_2$PL, e.g., Level 1 results in a 1% reduction, and Level 5 offers a 5% reduction. However, the specific magnitude of the advantage is determined by the procuring authorities.[104]

In order to be able to quantify the sustainability of the tendered material or project during the GPP process, the Dutch Ministry of Infrastructure and Water Management developed the software tool DuboCalc, which is now an inherent part of the Dutch GPP policy.[105] The DuboCalc is a Sustainable Construction Calculator that assesses the environmental impacts of a given material. It comprehensively calculates the impacts of materials from the beginning to the end of a product's lifecycle, as well as the energy consumed. The methodology follows the principles of LCA in accordance with ISO 14040 standards.[106]

Using LCA data, the DuboCalc calculates 11 different environmental impact parameters using the "shadow price method" (a pricing method that assigns a monetary value to an item, commodity, or service that is not ordinarily bought and sold in any market place) to calculate the ECI value.[107] The ECI value represents the environmental impact of a product or project translated into a number expressed in euros, which monetizes the environmental impacts of the product. Lower ECI values indicate lower environmental impact. DuboCalc allows designers to compare the ECI values of different designs, helping them choose the most environmentally sustainable option.[108] Similarly, the ECI enables procurement officers to evaluate proposals and pinpoint the bid that offers the optimal balance of price and quality.

When the DuboCalc tool is used in tandem with the $CO_2$PL, it allows procurement agencies to set a maximum ECI value that cannot be exceeded and then use the $CO_2$PL to certify that the tendered product or project effectively complies with those standards. Suppliers can use the tool to calculate ECIs for various design options, promoting optimization during the design phase. Both the $CO_2$PL and this software elevate the minimum environmental threshold for tenders and incentivize bidders to integrate carbon-reduction opportunities, providing them with a competitive advantage by subtracting the ECI monetized value of these benefits from the quoted price. As such, the method becomes compatible with a traditional bidding system that is ought to favor the most economically advantageous tender.[109]

Moreover, the MEAT principle (a cornerstone of the revised 2014 EU Procurement Directive for the public sector)[110] promotes evaluation based on the balance of product quality and cost-effectiveness, ensuring the best value for money

102 Bechauf, Turley, and Casier, *The CO2 Performance Ladder as a Tool for Low-Carbon Procurement: A Feasibility Study for 10 European Countries.*
103 *Going Green: Best Practices for Sustainable Procurement* (Paris: OECD Publishing, 2015), https://www.oecd.org/gov/public-procurement/Going_Green_Best_Practices_for_Sustainable_Procurement.pdf.
104 *Practical Manual: How Do You Use the CO2 Performance Ladder?* (Utrecht: SKAO, November 2021), https://www.co2-prestatieladder.nl/en/practical-manual.
105 Hasanbeigi, Becqué, and Springer, *Curbing Carbon From Consumption: The Role of Green Public Procurement.*
106 "What is DuboCalc?" DuboCalc.
107 *Going Green: Best Practices for Sustainable Procurement.*
108 *Country Case: Green Public Procurement in the Netherlands* (Paris: OECD Publishing, 2016), https://www.oecd.org/governance/procurement/toolbox/search/green-public-procurement-netherlands.pdf.
109 Hasanbeigi, Becqué, and Springer, *Curbing Carbon From Consumption: The Role of Green Public Procurement.*
110 DIRECTIVE 2014/24/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on public procurement and repealing Directive 2004/18/EC: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0024

(rather than the lowest price). Under the objective to optimize the use of taxpayers' money, this principle allows contracting authorities to develop tendering and award strategies that transcend mere cost analysis to encompass considerations such as life cycle costs, environmental impact, energy performance, and even innovation –such as the $CO_2$PL–, facilitating a balanced approach to procurement decisions.[111]

Under this Directive, procuring authorities are allowed to include carbon management and emissions reduction as technical specifications in the bidding process. Through its certification levels, the $CO_2$PL outlines explicit carbon reduction criteria and thus serves as a GPP evaluation criterion that can align with this particular EU Directive principle.

Upon contract award, the specified $CO_2$PL ambition level, as well as the ECI value for the project become an integral part of the contract, requiring implementation during project execution. The contractor must demonstrate achievement on both fronts, and failure to meet quality standards results in a 1.5 times sanction on the calculated price for quality value. Additionally, if the agreed $CO_2$PL level is not attained within a specified period, a 1.5 times sanction applies based on the initial advantage granted during submission.[112]

## 4. Differentiators of the $CO_2$PL

The GPP landscape includes various tools designed to measure, manage, and report carbon emissions and embedded carbon accounting of products. New tools continue to emerge, often with a single specific focus such as $CO_2$ emissions calculation, life cycle cost determination, or eco-labeling. These tools are typically developed independently of GPP and later applied within its framework. In this context, the $CO_2$PL is unique as a specialized tool specifically designed for low-carbon procurement in the railway sector that has evolved due to the influential role of public procurement in driving market changes across various sectors.[113]

By setting explicit $CO_2$ emissions reduction criteria, it avoids the common conflation between low-carbon and broader green criteria often seen in many GPP. Furthermore, this emphasis on reducing $CO_2$ emissions has transitioned from mere targets to tangible outcomes. As demonstrated by the CE Delft study, the $CO_2$PL has established a track record of use in public procurement, thereby demonstrating a substantiated impact on carbon mitigation, as previously referred to.[114]

The $CO_2$PL is managed by an independent non-profit organization, SKAO, and is a third-party verified system. Third-party verification adds value to procurers as it transfers the responsibility of compliance proof to accredited auditing firms, reducing the time and financial commitments required for supplier follow-ups. On the supply side, third-party verification acknowledges and rewards investments in carbon tracking, monitoring, and reduction systems, distinguishing companies with significant efforts in carbon management from those making fewer strides.[115]

Furthermore, $CO_2$PL introduces a finely detailed approach to carbon management and reduction efforts. Unlike other approaches that employ a singular baseline standard such as technical specifications or eco-labels – which often fail to distinguish between products that merely meet minimum standards and those that excel – $CO_2$PL adopts an approach that facilitates a deeper engagement with low-carbon considerations by categorizing efforts into a structured tier system comprising four essential components on five different levels. This, combined with the DuboCalc software system, provides a progressive roadmap for companies looking to work on reducing $CO_2$ emissions.

## 5. Limitations of the $CO_2$PL

### a. Low Ambition Levels

Even in countries that have rolled out the $CO_2$PL, there is no requirement for companies to have a $CO_2$PL certificate nor a specific ambition level of the ladder when entering the tendering. This means even firms without a $CO_2$PL can still participate in the bidding process, though they miss out on potential discounts. Additionally, companies aspiring to avail of the discount are not required to provide proof of fulfilling any ambition level at the time of tendering. Instead, if the companies secure a contract with declared ambition level, they are given a time-frame of one-year after the contract award to demonstrate their claimed compliance with the registered ambition levels.[116]

111 Lewis, Kaaret, Morales, Piirsalu, and Axelsson, *Green Public Procurement: A Key to Decarbonizing Construction and Road Transport in the EU.*
112 *Going Green: Best Practices for Sustainable Procurement.*
113 Bechauf, Turley, and Casier, *The $CO_2$ Performance Ladder as a Tool for Low-Carbon Procurement: A Feasibility Study for 10 European Countries.*
114 Schep, Bachaus, Bijleveld, and Deen, *Evaluation of the $CO_2$ Performance Ladder: Existing Literature and Data Review.*
115 Bechauf, Turley, and Casier, *The $CO_2$ Performance Ladder as a Tool for Low-Carbon Procurement: A Feasibility Study for 10 European Countries.*
116 Ronja Bechauf, Laura Turley, and George Thurley, *Frequently Asked Questions: Legal Considerations of CO2 Performance Ladder in Public Procurement* (Winnipeg: IISD, March 2023), https://www.iisd.org/system/files/2023-03/co2-ladder-public-procurement-faq.pdf.

Moreover, while the scheme offers companies a structured pathway to commit to emission reductions, the ambiguity around target definitions has led to inconsistencies and, in some cases, arguably unambitious goals. A study of corporate practices reveals that those certified at level 5, the highest echelon of $CO_2$PL, might be inclined to set conservative $CO_2$ emission reduction targets, given the risk of certificate forfeiture if they fail to achieve these targets. However, when comparing the ambition levels of firms holding certificates at levels 3 or 4 to those at level 5, no significant difference in the ambition of their targets is noted.[117] This is an opportunity for improvement where the $CO_2$PL should potentially emphasize the importance of continuous improvement.

A different study also showed that companies frequently implemented energy management measures that aligned with the $CO_2$PL requirements solely at an administrative level and often just as an administrative checklist rather than real management solutions, especially when it came to transparency and participation aspects of the ladder.[118] Therefore, third-party verification and compliance assessments should focus on spurring genuine and tangible energy management improvements in companies' core processes and projects to ensure actual $CO_2$ emissions reduction.

Lastly, the ambition assessment of the $CO_2$PL is based on a best-in-class approach and not a normative approach. It means that the evaluators review all companies according to the best performer in a sector but not according to best practices. The implication is that the $CO_2$PL is not suited to bring up innovations but rather to bring innovations to scale.[119] While the need for innovation in climate solution is vast, the need to scale existing solutions is just as acute.

### b. Slow-paced Uptake

While the $CO_2$PL's methodology may align with the MEAT principle outlined in the 2014 Public Procurement EU Directive, it does face some challenges in adapting to diverse legal contexts. Within the EU, a prevalent risk-averse tendency exists in different jurisdictions, particularly concerning compliance with national legal frameworks and specific regulatory requirements of the EU Directive. Indeed, a 2023 feasibility study to implement the $CO_2$PL in 10 different European countries[120] showed that countries are hesitant to apply the $CO_2$PL in their specific contexts.[121]

Even in European nations that already have advanced GPP policies in place such as Denmark, Sweden, and Germany, procuring authorities frequently show hesitation on the adoption of $CO_2$PL as an award criterion because efforts to integrate environmental criteria into procurement processes are often challenged in court. For instance, procurement law is very strict in Sweden and, as a result, multiple legal challenges to procurement approaches are brought to court every year.[122]

Moreover, there is a lack of understanding in several jurisdictions on how the $CO_2$PL is fully compatible with the EU Public Procurement Directive. For instance, a particular concern of the Swedish government regarding the use of $CO_2$PL in public procurement is how to establish a clear link between award criteria and the subject matter of the contract, which is a requisite of the 2014 EU Public Procurement Directive.[123] Similar concerns have been raised by the governments of Spain and Poland on specific requisites of the 2014 EU Public Procurement Directive, particularly on the need to accept equivalent means of proof for company activities related to the contract and not just one specific label.[124]
These European examples illustrate the conservative attitude of public procurement agencies and the rigidity of legal frameworks. These are not specific to the EU and pose a problem for a wider adoption of innovative tools like the $CO_2$PL supporting more effective implementation of GPP.

The successful integration of such tools will require legal clarifications on how these tools can align with local and regional frameworks and a change in mindset at public procurement institutions and agencies.

117 Martijn Rietbergen, *Targeting Energy Management: Analysing Targets, Outcomes and Impacts of Corporate Energy and Greenhouse Gas Management Programs* (Utrecht: Uitgeverij BOXPress, 2015), https://media.co2-prestatieladder.nl/media/targeting-energy-management-analysing-targets-outcomes-and-impacts-of-corporate-energy-and-greenhouse-gas-management-programmes.pdf
118 Reitbergen, Opstelten, and Blok, "Improving Energy and Carbon Management in Construction and Civil Engineering Companies."
119 Interview with experts, June 2023

120 Including Austria, Denmark, Germany, Ireland, Italy, Poland, Slovenia, Spain, Sweden and the UK.
121 Bechauf, Turley, and Casier, *The $CO_2$ Performance Ladder as a Tool for Low-Carbon Procurement: A Feasibility Study for 10 European Countries.*
122 Bechauf, Turley, and Casier, *The $CO_2$ Performance Ladder as a Tool for Low-Carbon Procurement: A Feasibility Study for 10 European Countries.*
123 European Patent Office, Article 67, Rights Conferred by a European Patent Application After Publication, Section 3, November 29, 2000, https://www.epo.org/en/legal/epc/2020/a67.html.
124 Bechauf, Turley, and Thurley, *Frequently Asked Questions: Legal Considerations of CO2 Performance Ladder in Public Procurement.*

### c. Potential Limited Outreach

There is a disproportionate adoption of $CO_2PL$ by SMEs, which constituted about 75% of the 4,000 certified companies in 2022.[125] SMEs are inclined to adopt $CO_2PL$ to gain a competitive edge during tendering, whereas larger firms, possibly due to economies of scale and market share, are less motivated to seek certification, thereby leaving a considerable segment of the market possibly untouched.

This divergence in adoption patterns implies that while SMEs are actively leveraging the $CO_2PL$ to enhance their competitiveness and environmental credentials, there exists an untapped segment within larger corporations. Encouraging broader adoption across all scales of enterprises could potentially amplify the positive environmental impact facilitated by the $CO_2PL$ and contribute to a more comprehensive and sustainable transformation within the business landscape. Efforts to address barriers to adoption, such as promoting the long-term benefits and broader market positioning associated with $CO_2PL$ certification, may play a crucial role in extending its reach to a more diverse array of companies.

### d. Underlying Calculation Differences

To account for $CO_2$ emissions, companies use different quantification methods, ranging from proprietary tools like Arcadis's $CO_2$ Tool Rail to third-party software such as DuboCalc, SimaPro, and Ecochain.[126] This inconsistency introduces a layer of uncertainty to the data and hampers uniform interpretation. Certification requirements lack clarity, resulting in divergent understanding among various stakeholders, including third-party certification agencies, the scheme owner, and consultants. This added to the fact that the $CO_2PL$ has not yet integrated nor is it aligned with EPDs.[127] As we highlighted earlier, even though this inconsistency in calculation methods (and EPDs) is a prevalent challenge in GPP, usually irrespective of the models or tools employed, EPDs have in fact become widespread across Europe as an LCA method to report on product's environmental impacts. Consequently, as the $CO_2PL$ evolves, it will be fundamental to align with common carbon measurement methods such as EPDs and to integrate these into the $CO_2PL$ to safeguard harmonization and comparability.

125 Schep, Bachaus, Bijleveld, and Deen, *Evaluation of the CO2 Performance Ladder: Existing Literature and Data Review.*
126 Schep, Bachaus, Bijleveld, and Deen, *Evaluation of the CO2 Performance Ladder: Existing Literature and Data Review.*
127 Bechauf, Turley, and Casier, *The CO2 Performance Ladder as a Tool for Low-Carbon Procurement: A Feasibility Study for 10 European Countries.*

## B. Carbon Contracts for Difference

While the $CO_2PL$ can be effective in scaling best-in-class climate solutions, there is a recognized need for mechanisms that can foster and introduce innovative solutions to the market, especially in energy-intensive industries, through GPP. Many cutting-edge, low-carbon production methods for essential materials are effectively more expensive than conventional high-carbon alternatives. This applies to various processes, such as low-carbon cement and hydrogen-based steel production, among others. Despite their potential impact, these innovations struggle to compete in price with established but environmentally harmful alternatives and have no solid demand willing to pay the cost of reduction needed to pull them forward. Carbon price is often seen as a tool to drive economic competitiveness for many crucial low-carbon technologies vis-à-vis the cheaper "high carbon" alternatives, but current carbon prices (in jurisdictions implementing it) are often too low to be effective in that regard, and are unlikely to become high enough anytime in the near future.[128]

### 1. The General Concept of Carbon Contracts

Carbon Contracts, though not a direct form of GPP, share notable similarities with GPP, particularly in its subsidy-oriented nature. Both mechanisms provide pivotal support to low-carbon technologies and products accelerating the decarbonization of industries. In essence, carbon contracts, because of its built-in subsidy, can be viewed as a variant of preferential buying[129]—an incentive mechanism that has the potential to complement and enhance the current GPP framework.

Standalone carbon contracts are long-term contracts between the signing parties that mitigate the uncertainty related to changing climate policies and carbon pricing (on the supply side) and the advancement of low-carbon technologies (on the demand side). The signing parties involved – usually the government and a company – agree on a fixed carbon price (although a variable price is less common but also possible) over the period of time covering the contract, which intends to provide the company with a certain future compensation for the incremental costs derived from investing in low-carbon technology that results in $CO_2$ emissions reductions. [130]

128 Sartor and Bataille, *Decarbonising Basic Materials in Europe.*
129 Sartor and Bataille, *Decarbonising Basic Materials in Europe.*
130 Tim Gerres, and Pedro Linares, *Carbon Contracts for Differences: Their Role in European Industrial Decarbonization* (London: Climate Strategies, September 2020), 1, https://climatestrategies.org/publication/carbon-contracts-for-differences-their-role-in-european-industrial-decarbonisation/..

### a. Incremental Costs and $CO_2$ Reduction Cost

As compared to the conventional carbon-emitting technology, the incremental cost of low-carbon technologies in the hard-to-abate sectors arise from higher capital expenditure (CAPEX) and increased operating expenditure (OPEX), with the former generally driven by higher investment in decarbonization technology implementation (i.e. equipment or infrastructure costs) and higher risk and financing costs of these innovative technologies; and the latter generally stemming from price spreads in energy sources, raw materials, and operating resources.[131] The $CO_2$ reduction cost (€/t $CO_2$) results from the incremental cost attributed to one ton of verifiable $CO_2$ emission reductions via low-carbon processes of a determined material.[132] It is based on the ratio of the incremental costs of low-carbon technologies relative to the costs of conventional technology, divided by the amount of the $CO_2$ emissions reduction achieved as a result of the adoption of low-carbon technologies per each ton of material.

131 Philipp D. Hauser, Helen Burmeister, Paul J. Münnich, Wido K. Witecka, and Thomas Mühlpointner, *Transforming Industry through Carbon Contracts: Analysis of the German Steel Sector* (Berlin: Agora Industry, 2022), https://www.agora-energiewende.de/en/publications/transforming-industry-through-carbon-contracts-steel/.

132 Hauser, Burmeister, Münnich, Witecka, and Mühlpointner, *Transforming Industry through Carbon Contracts: Analysis of the German Steel Sector*.

Price fluctuations of the components that determine incremental costs have a high influence on the $CO_2$ reduction cost, especially in the energy-intensive heavy industry.[133] Typically, in these hard-to-abate sectors,[134] when the input prices for low-carbon technologies increase, the $CO_2$ reduction cost also tends to rise. Conversely, an increase in the cost of inputs for reference technologies typically results in a decrease in the $CO_2$ reduction cost.

133 Tim Gerres, and Pedro Linares, *Carbon Contracts for Differences (CCfDs) in a European Context* (London: Climate Strategies, June 2022), https://henrike-hahn.eu/files/upload/aktuelles/dateien/Study_CCfD_Henrike-Hahn_6.2022.pdf.

134 Nonetheless, it is worth mentioning that the financial model underlying clean energy technologies in other sectors different to the heavy industry, such as solar and wind power, is characterized by higher initial CAPEX and lower OPEX compared to incumbent alternatives like natural gas and coal. This structure renders them less susceptible to market fluctuations, offering a more stable economic profile over the long term.

**Box 7: The Steel Industry Case**

The steel industry serves to illustrate an example of a case where there is a substantial incremental cost between low-carbon technologies and conventional technologies. With this example, we do not aim to provide an exhaustive analysis of all possible steel decarbonization pathways and technologies available. Instead, our intention is to illustrate how incremental costs can impact a specific industry. Therefore, we will only compare the Blast Furnace - Basic Oxygen Furnace (BF-BOF) route to the Direct Reduced Iron - Electric Arc Furnace (DRI-EAF) route (specifically excluding the use of scrap).

The BF-BOF stands as the conventional method for primary steel production, yet highly carbon-intensive with more than 80% of the steel sector's carbon emissions coming from the BF-BOF process.[135] The Electric Arc Furnace (EAF) route through Direct Reduced Iron (DRI), emerges as one of the low-carbon alternative processes, yet much more expensive to operate. DRI-EAF produces only 1.2 $tCO_2$ per ton of crude steel, a stark contrast to the 2.3 $tCO_2$ per ton of crude steel from BF-BOF.[136]

135 "What is Steel and How is it Made?" European Steel Association, March 30, 2020, https://www.eurofer.eu/about-steel/learn-about-steel/what-is-steel-and-how-is-steel-made.

136 Mimi Khawsam-ang, Max de Boer, Grace Frascati and Gernot Wagner, *Decarbonizing Steel* (New York: Columbia Business School Climate Knowledge Initiative, March 2024), https://leading.business.columbia.edu/climate/steel/decarbonizing-steel.

Scaling up this decarbonization technology for the steel industry entails incremental costs for manufacturers. In terms of CAPEX, the DRI-EAF route would require a higher initial capital expenditure of 63 euros per ton of steel production compared to the BF-BOF route in the current state of technical feasibility.[137] This increase in cost is attributed to the need for new facilities for DRI-EAF to replace BF-BOF capacities, which is to be compared to reinvestment in BF-BOF's route involving merely relining of existing plants, prolonging their life and optimizing carbon efficiency.

However, the most pronounced cost difference stems from the operational costs linked to the different energy sources used as the reducing agents during the process inherent to the DRI-EAF route, including hydrogen and natural gas.[138] Specifically, through a DRI-EAF process, a ton of steel requires an average of 108 euros of natural gas or 267 euros of hydrogen compared to 98 euros of coking coal used in BF-BOF (bearing in mind that the costs of these commodities may vary).[139] Moreover, DRI-EAF process requires the use of electricity as an input. As such, the cost dynamic of low-carbon steel exhibits a complex interplay closely tethered to the fluctuating pricing of hydrogen, natural gas, and electricity.

137 Hauser, Burmeister, Münnich, Witecka, and Mühlpointner, *Transforming Industry through Carbon Contracts: Analysis of the German Steel Sector.*

138 Starting with natural gas is not only more economically viable but will also deliver a substantial emission reduction — around 66% less than BF-BOF. As the process advances, the share of hydrogen can be increased progressively, a transition that can be achieved without significant retrofitting of the original plants. From a strategic perspective, investing in DRI facilities serves as a safeguard for continuous production and would establish a flexible demand framework for renewable hydrogen. Source: Gerres, and Linares, *Carbon Contracts for Differences: Their Role in European Industrial Decarbonization.*

139 Hauser, Burmeister, Münnich, Witecka, and Mühlpointner, *Transforming Industry through Carbon Contracts: Analysis of the German Steel Sector.*

### b. Carbon Contracts Price

Carbon Contracts operate independently of an established carbon market. A carbon contract functions as a subsidy covered in its entirety by the government that exclusively addresses the compensation of incremental costs incurred by the company implementing the decarbonization technology. To achieve this, the carbon contract price is calculated as a ratio to cover the incremental costs divided by the unit of specific and verifiable emissions reductions.[140] Carbon contracts are most often used in Carbon Capture and Storage (CCS) or in carbon farming[141] where the ton of carbon is the commodity being marketed directly through CO2 emissions reductions.

140 Jörn C. Richstein, *Project-Based Carbon Contracts: A Way to Finance Innovative Low-Carbon Investments* (Berlin: German Institute for Economic Research, 2017), p.9, https://www.diw.de/documents/publikationen/73/diw_01.c.575021.de/dp1714.pdf.

141 Carbon farming refers to a suite of agricultural practices designed to enhance the capture and storage of carbon dioxide ($CO_2$) from the atmosphere in soils, plants, and trees. By integrating methods such as cover cropping, no-till farming, agroforestry, and improved grazing management, carbon farming increases the organic matter in the soil, promotes healthy root systems, and stores carbon in vegetation. These practices not only help mitigate climate change by sequestering carbon but also improve soil health, boost crop yields, and support biodiversity. Additionally, carbon farming can reduce emissions of other greenhouse gases, and enhance ecosystem resilience. For more on the effects, trade-offs, and additionality of carbon farming see: Carsten Paul, Bartosz Bartkowski, Cenk Dönmez, Axel Don, Stefanie Mayer, Markus Steffens, Sebastian Weigl, Martin Wiesmeier, André Wolf, Katharina Helming, "Carbon farming: Are soil carbon certificates a suitable tool for climate change mitigation?" *Journal of Environmental Management,* Volume 330, (2023): ISSN 0301-4797, https://www.sciencedirect.com/science/article/pii/S0301479722027153

For instance, a company has found a way to cut down their $CO_2$ emissions by installing a new technology. They sign a carbon contract with the government that says, "For the next five years, we will pay you $50 for every ton of $CO_2$ you reduce." So, every time the company reduces a ton of $CO_2$, they earn $50, no matter what the carbon price is elsewhere. This makes it easier for them to invest in clean technologies because they know they will get paid for their efforts.

In summary, a carbon contract is a deal that locks in a specific carbon price for reducing emissions, based on the company's incremental costs to achieve those emissions reductions, helping to encourage and financially support efforts to cut down on $CO_2$ emissions.

## 2. Carbon Contracts in a Carbon Market: Carbon Contracts for Difference (CCfD)

Carbon Contracts for Difference (CCfDs) are a type of Carbon Contract, that uses (i) a Contract for Difference (CfD) price settlement mechanism, and (ii) the carbon market price as reference price to compensate companies that implement decarbonization technologies for the additional cost of $CO_2$ emission reductions above current carbon price market levels. CCfDs entail national governments entering into long-term agreements with private parties to cover the gap between the prevailing carbon price and the real cost of $CO_2$ reduction. CCfDs promise to pay for the increased cost of reducing $CO_2$ emissions (what is commonly known as the "green premium").

The concept of CCfD builds upon the established principle of CfDs, which are widely used to support renewable energy projects and have been used since 2014, when the UK introduced them to support deployment of large-scale renewable projects.[142] In a CfD, when the 'strike price' (the cost of production plus margin to achieve a return) of a low-carbon fuel exceeds the 'reference price' (typically based on the market price of status-quo production), the government compensates the producer for the revenue difference.

However, being a merge between carbon contracts and CfDs, in a CCfD, the reference price will be determined by the carbon price. In regions where a relatively mature carbon market has been established, the **carbon price** (€/t $CO_2$) represents the market price of emitting one ton of $CO_2$. For instance, in the EU, this price varies within the framework of the regular EU Emissions Trading System (EU-ETS). The EU-ETS, being a cap-and-trade system, sets a number of maximum emissions that can be emitted. This cap is split into individual allowances, each one represents the right to emit one ton of $CO_2$. In this system, covered participants are allowed to buy and sell those allowances on the market, resulting in a fluctuating market price for carbon. When a robust carbon market like this exists, the carbon contract results in a CCfD in which the $CO_2$ market price has a direct effect on the calculation of the final contract price, where the government and the company running an innovative project agree on a set price for $CO_2$, as will be detailed below.[143]

The CO2 price influences the recoverability of production costs of low-carbon technologies by either advantaging or disadvantaging the incumbent technology as well as bringing a potential source of revenues to recover the cost (see section c of this chapter for further explanations). In this way, if well designed, it can potentially work more effectively than an advanced market commitment, guaranteeing offtake: This is also a long-term mechanism but it self-adjusts to market circumstances protecting public finance while ensuring the necessary price for the producer.

## 3. Elements of a CCfD

Differently than the Carbon Contract price, the CCfD price is comprised by several elements.[144]

### a. Strike Carbon Price

The **strike price** in a CCfD will be a set carbon price agreed by the parties and expressed in €/t $CO_2$. The strike price, also known as the contract price (equal to the carbon contract price in carbon contracts) is set as a hedging mechanism to protect companies from the uncertainties of the fluctuating conditions of the carbon market as well as the incremental costs incurred for each ton of $CO_2$ emission reduced. The strike price is an agreed $CO_2$ price that is set by calculating the

142 "Contract for Difference (CfD)", International Energy Agency, https://www.iea.org/policies/5731-contract-for-difference-cfd.

143 Hauser, Burmeister, Münnich, Witecka, and Mühlpointner, *Transforming Industry through Carbon Contracts: Analysis of the German Steel Sector*

144 Gerres, and Linares, *Carbon Contracts for Differences (CCfDs) in a European Context.*

average $CO_2$ reduction cost (€/t $CO_2$). The average $CO_2$ reduction cost is a function of the average incremental costs (incremental CAPEX plus incremental OPEX), divided by the verifiable $CO_2$ emissions reduced per ton of material through the implementation of the novel decarbonization technology.[145] Through this formula, the emissions savings per ton of material produced are compensated. Should the carbon price drop below the strike price, the company will receive additional payments from the government. However, if the carbon price exceeds the strike price, the company will be responsible for compensating the difference.[146] In this way, as the carbon price increases, the government's subsidy can either decrease or the government can even recoup its costs until the market is completely stabilized, at which point the CCfD can be removed altogether. Thus, it can be a cost-effective public finance mechanism for the government (this is further discussed later).

The CCfD strike price can either be fixed or variable.[147] The fixed strike price will usually be set for the duration of the contract. This predetermined price provides predictability and stability, crucial for fostering long-term planning and investments in low-carbon technologies. However, when employing a fixed mechanism, the fluctuations in OPEX, such as higher costs of energy or raw materials, create an increased risk for the manufacturers that could potentially reduce the incentives to invest in low carbon technologies. To address this, higher CCfD strike or contract prices would be necessary to incentivize investments and assure investors that underfunding is not a concern. As an alternative, a variable strike price indexes the strike price to another variable cost, typically an energy or input price to capture the fluctuations in incremental costs.

The variable strike price could be indexed to a direct input such as the price of a particular fuel or raw material, or it could be indexed to the inputs of a conventional process. For instance, in the steel industry, the strike price could be based on the price of coking coal as an input of the BF-BOF process. Higher coking coal prices would lead to increased production costs and, therefore, drive up selling prices for primary steel produced through conventional processes. At the same time, the CO2 reduction cost decreases. Consequently, the additional support required for EAF-DRI as the novel production process to compete with the market price of conventional primary production decreases.[148] Alternatively, in a similar way, the strike price could be variable subject to the price of green hydrogen as an input of the EAF-DRI process, where higher green hydrogen prices would lead to increased production costs for low-carbon steel production. Therefore, the CO2 reduction cost increases and the additional support required for this novel production process to compete with conventional production also increases. However, linking the strike price to the price of green hydrogen presents several challenges, notably the absence of a market for green hydrogen, which precludes the establishment of an index price. Consequently, selecting this approach would necessitate forward-looking measures to enable accurate indexing. Ultimately, it is theoretically feasible to index the strike price to inputs from either conventional or green technologies; in the former, the relationship is inversely proportional, while in the latter, it is directly proportional.

This dynamic pricing structure hedges against the unpredictability of input prices and transfers this risk from the company to the government, thus ensuring low-carbon technologies remain competitive against their conventional counterparts.

145 Strike Price = (ΔCAPEX + ΔOPEX)/(CO2 emissions reduction (tCO2/tmaterial))

146 Gerres, and Linares, *Carbon Contracts for Differences (CCfDs) in a European Context.*

147 Oliver Lösch, Nele Friedrichsen, Johannes Eckstein, Jörn C. Richstein, *Carbon Contracts for Difference as Essential Instrument to Decarbonize Basic Materials Industries* (ECEEE, September 2022), https://publica-rest.fraunhofer.de/server/api/core/bitstreams/b3a1949c-97f6-4d69-a37d-9cb2458fb03b/content.

148 Hauser, Burmeister, Münnich, Witecka, and Mühlpointner, *Transforming Industry through Carbon Contracts: Analysis of the German Steel Sector.*

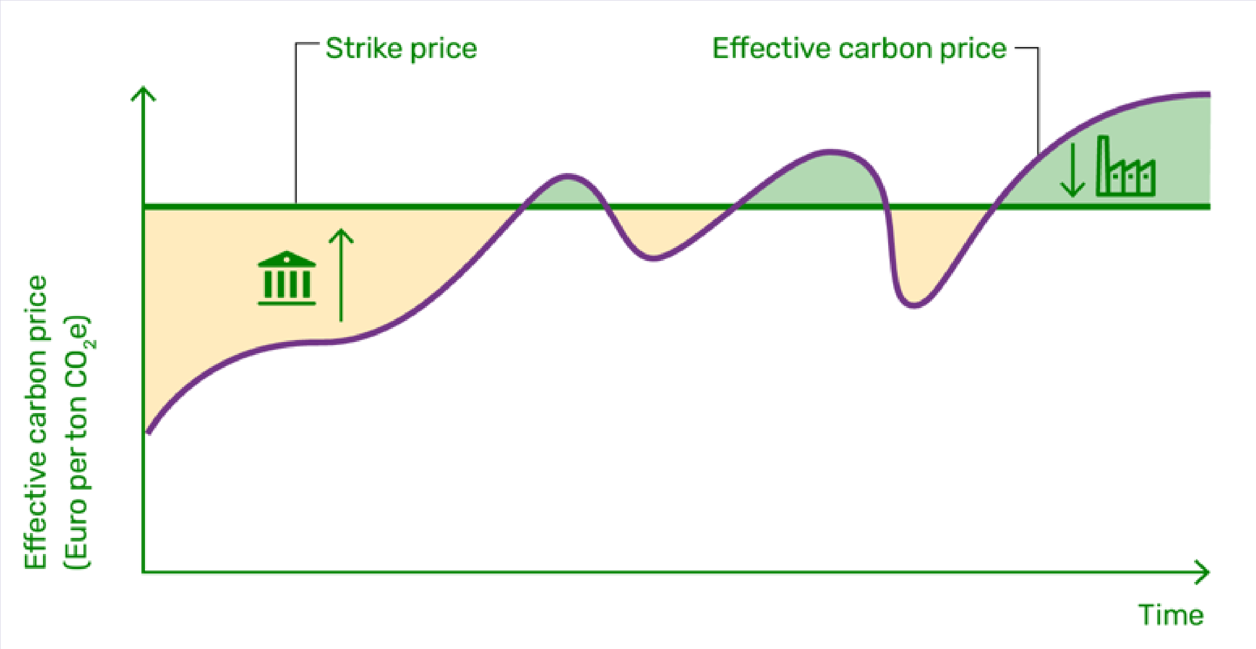



**Figure 1. Operation of a CCfD**

*Source: Climate Strategies. Carbon Contracts for Differences (CCfDs) in a European context*[149]

149 Gerres, and Linares, *Carbon Contracts for Differences (CCfDs) in a European Context.*

## b. CCfD Premium

The CCfD premium is the difference between the strike price and the prevailing $CO_2$ market price. Given that companies engaging in CCfDs are active participants in a carbon market, the value of the allowance interacts directly with the CCfD price settlement. For instance, in the EU, when it comes to the EU Allowance (EUA), there are three different scenarios for this interaction: (i) the free allocation for conventional technologies; (ii) the no free allocation for conventional technologies; (iii) the sale of allowances in the market by companies implementing low-carbon solutions.

(i) Free Allocation for Conventional Technologies:

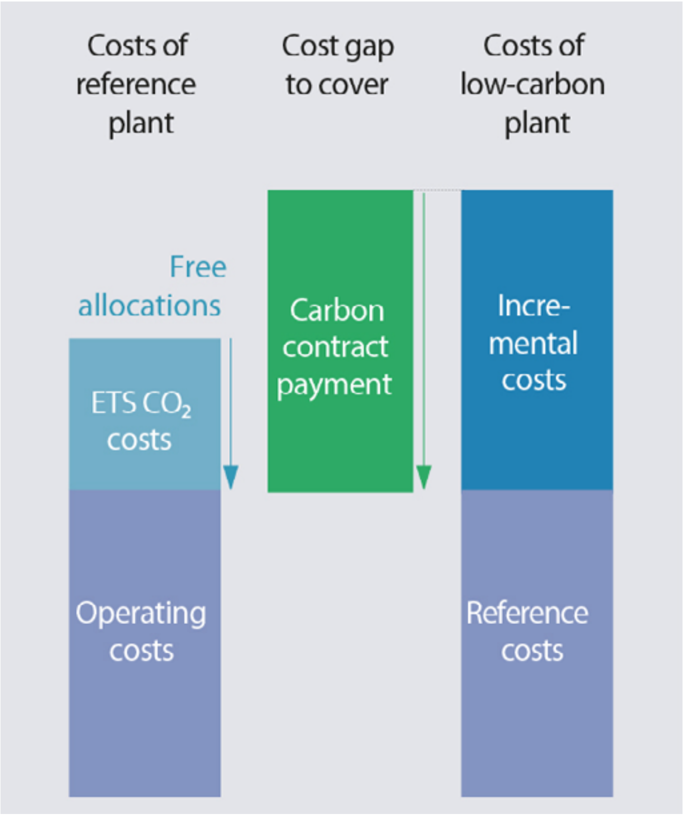



**Figure 2.**

*Source: Agora Institution, FutureCamp, Wuppertal Institute and Ecologic Institute, "Transforming industry through carbon contracts: Analysis of the German steel sector" (2022)*

Free allocations are a quota of allowances from economic sectors participating in the EU ETS that are not subject to the carbon price, such as high-emitting industry. Presently, circa 40% of industrial emissions benefit from free allocations,[150] rendering the effective $CO_2$ market price substantially lower for this sector and, consequently, reducing the motivation to foster innovation and invest in more environmentally friendly production processes. When conventional technologies are given free allowances under the ETS, they are not required to pay for their carbon emissions, which in turn lowers their ETS $CO_2$ costs. As a result, the incremental costs for the low-carbon solution will be higher compared to the conventional plant, and the CCfD payout (which will be covered 100% by the CCfD) will need to be larger, as shown in the following graph.

(ii) No Free Allocation for Conventional Technologies:

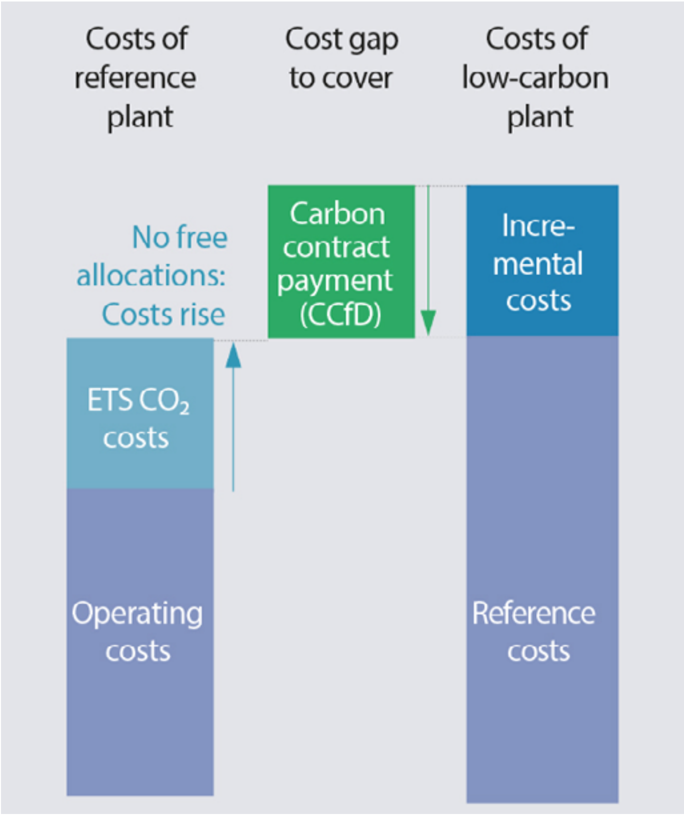



**Figure 3.**

*Source: Agora Institution, FutureCamp, Wuppertal Institute and Ecologic Institute, "Transforming industry through carbon contracts: Analysis of the German steel sector" (2022)*

Conversely, if the conventional technologies do not receive free allocations, they must purchase allowances to cover their high emissions, thereby increasing their ETS $CO_2$ costs. This increment in $CO_2$ costs of conventional technologies reduces the gap between the conventional technology costs and the low-carbon technology costs, making the average incremental costs for the low-carbon solution lower. As a result, the CCfD payout (which will be covered 100% by the CCfD) will be smaller than the Free Allocation for Conventional Technologies scenario, as shown in the following graph.

150 "Free Allocation," European Commission, https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/free-allocation_en#:~:text=At%20the%20beginning%20of%20the,but%20have%20to%20buy%20them.

(iii) Sale of Allowances in the Market by Companies Implementing Low-Carbon Solutions:

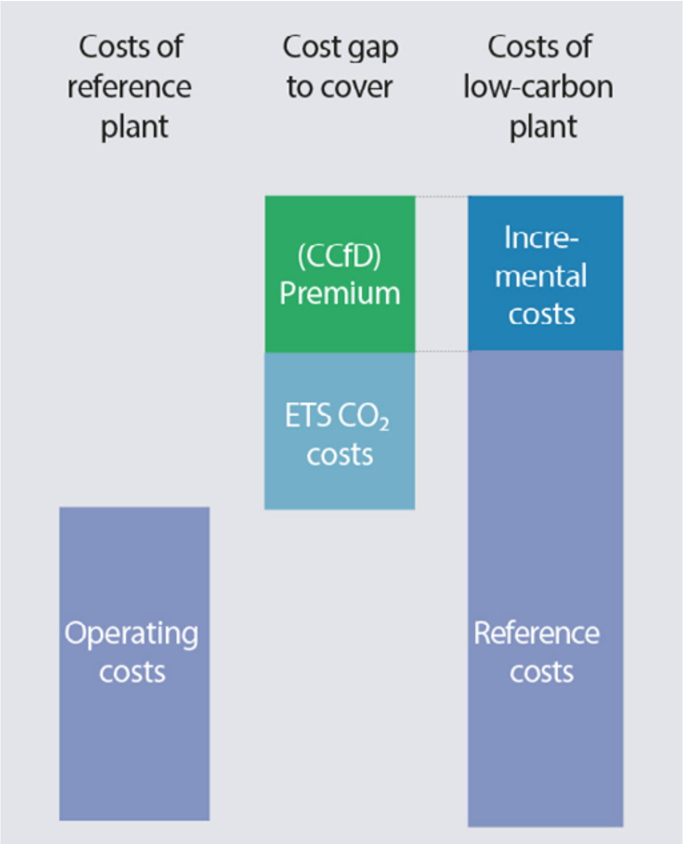



**Figure 4.**

*Source: prepared by the authors.*

Considering that the companies that implement low-carbon solutions are effectively and verifiably reducing their $CO_2$ emissions, the structural framework of CCfDs presupposes that these companies, throughout the contract period, will be able to sell allowances in the ETS corresponding to the emissions they reduce, and thus generate revenue from this sale. This revenue stream serves to partially offset their incremental costs, which means that the CCfD will not cover 100% of the incremental costs. The CCfD premium acts as a way to offset the extra costs of new technologies that the carbon market's net revenue doesn't fully cover, as shown in the accompanying graph.[151]

In situations where carbon pricing mechanisms exist but a formalized carbon market is absent, (for instance, where a carbon tax is present), the CCfD can serve as a financial hedging mechanism. In this capacity, the CCfD guarantees a consistent and predetermined carbon price (the strike price), over a long-term period for the participating company. The CCfD, in this context, provides companies with a strategic tool to manage risks associated with carbon pricing dynamics, offering a mechanism for long-term planning and investment in low-carbon technologies.

### c. Tendering Design

It is important for CCfDs to maintain a competitive tendering process. Public auctions tend to be the most economically efficient way to award CCfDs. Companies vying to implement new emission-reducing processes bid on their required strike price, and the government will select the lowest bid among all qualifying projects.

However, awarding CCfDs primarily based on cost could favor sectors that can reduce their emissions at a lower cost, leaving hard-to-abate industries without funding opportunities.[152] To counter these limitations, an approach referred to as 'maturity-pots'[153] has been suggested. This method involves grouping applications from eligible industries with similar technological maturity levels into separate auction pots, enabling simultaneous abatement across different sectors.

## 4. Current CCfD Implementation

The implementation of Carbon Contracts and CCfDs in practice is flexible, contingent on context, legal frameworks, and the type of carbon pricing available in the jurisdiction. CCfDs used as tool to help commercialize innovative low-carbon basic materials projects was first proposed by Richstein[154] in 2017.[155] Since then, these tools have been under study and they are still in the early stages of development and implementation. The only country that has consistently implemented CCfD schemes is the Netherlands. Germany

151 Hauser, Burmeister, Münnich, Witecka, and Mühlpointner, *Transforming Industry through Carbon Contracts: Analysis of the German Steel Sector.*

152 Gerres, and Linares, *Carbon Contracts for Differences (CCfDs) in a European Context.*

153 Ben McWilliams & Georg Zachmann, *Commercialisation contracts: European support for low-carbon technology deployment,* (Bruegel, July 2021), https://www.bruegel.org/sites/default/files/wp_attachments/PC-2021-15-commercialisation.pdf Gerres, and Linares, *Carbon Contracts for Differences (CCfDs) in a European Context.*

154 Senior Economic Researcher at DIW German Institute for Economic Research in Power markets & climate-neutral industry

155 Joern Constantin Richstein, "Project-Based Carbon Contracts: A Way to Finance Innovative Low-Carbon Investments," *DIW Berlin Discussion Paper* no. 1714, 2017, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3109302.

and Canada have recently announced implementation of CCfDs in their jurisdictions, but execution is still underway.

### a. The Netherlands: SDE++ Scheme

Managed by the Netherlands Enterprise Agency, the Sustainable Energy Production and Climate Transition Incentive Scheme (SDE++) in the Netherlands is a project-specific, put-option program, aimed at supporting renewable electricity generation, renewable heat, renewable gas, low-carbon heat, and low-carbon production processes on a large scale.[156] Launched in 2020 with an annual budget of €8 billion for 2023, the scheme offers subsidies to manufacturers, with subsidies compensating for the difference between the cost of sustainable energy or the reduction in $CO_2$ emissions and the revenue.[157]

Manufacturers bid for subsidies based on their expected carbon reduction. Specifically, the subsidy amount is calculated by establishing a base rate and a correction amount. The base rate, which is set for each specific technology, is the cost price for the reduction of $CO_2$ emissions (this is equivalent to the $CO_2$ reduction cost element described above). The base rate is the maximum amount of subsidy a company can apply for. The application amount (equivalent to the strike price described above) is the amount of subsidy that the company applies for, which can never be higher than the base rate and will be fixed for the entire duration of the contract; durations are periods lasting 12 or 15 years.[158]

If the company implementing the low-carbon technology generates any revenue derived from its operation, from the sale of energy, as result of the sale of $CO_2$ emissions allowances under the EU-ETS, or by avoiding the purchase costs of these allowances, then a corrective amount (similar to the CCfD premium explained above) corresponding to the revenue or savings generated will be subtracted from the base rate. This amount is set annually and can be adjusted to reflect market values.[159]

156 "SDE++Apply," Netherlands Enterprise Agency, https://english.rvo.nl/en/subsidies-financing/sde/apply.

157 SDE++2023: *Stimulation of Sustainable Energy Production and Climate Transition* (Zwolle: Netherlands Enterprise Agency, August 2023), https://english.rvo.nl/sites/default/files/2023-09/BrochureSDE2023English.pdf

158 *SDE++2023: Stimulation of Sustainable Energy Production and Climate Transition.*

159 *SDE++2023: Stimulation of Sustainable Energy Production and Climate Transition.*

**Box 8: Porthos Project**

Porthos stands for Port of Rotterdam $CO_2$ Transport Hub and Offshore Storage. This is a partnership between the Port of Rotterdam Authority, Gasunie and EBN, which aims to capture the $CO_2$ from different companies, who will supply it through a collective pipeline in the Port of Rotterdam, then pressurized in a compressor station, consequently transported through an offshore pipeline leaving from the Port of Rotterdam, and finally store it in empty gas fields beneath the North Sea at around 20 km off the coast and 3km beneath surface. The aim of Porthos is to store circa 37 Mton CO2 in a 15-year period.[160]

In the SDE++ round of 2021, the Dutch government awarded €2.1 billion to Porthos for four customers: Air Liquide, Air Products, Exxon Mobil and Shell. This was a historical award of a CCfD scheme to a low-carbon production project that will bridge the gap between the current $CO_2$ emission allowances rates from the EU-ETS and the costs involved in the capture and storage of $CO_2$, enabling companies to cut back their $CO_2$ emissions without compromising their competitiveness.[161] This also allowed the project to move forward, as the subsidy funding under the SDE++ was crucial when taking the final investment decision for Porthos in October 2023. Construction of the project's infrastructure will begin in January 2024 and the whole system will start operating in 2026.[162]

160 "Project," Porthos *$CO_2$* Transport and Storage C.V., https://www.porthosco2.nl/en/project/.

161 "SDE++Subsidy Fund for CCS Projects," International Energy Agency, November 17, 2022, https://www.iea.org/policies/13920-sde-subsidy-fund-for-ccs-projects.

162 "Dutch Government Supports Porthos Customers with SDE++ Subsidy Reservation," Porthos CO2 Transport and Storage C.V., https://www.porthosco2.nl/en/dutch-government-supports-porthos-customers-with-sde-subsidy-reservation/

While the SDE++ scheme is ambitious, it has attracted varied feedback from industry stakeholders and academia. A salient critique is the scheme's dual award mechanism, which some argue leads to an unequal funding distribution among diverse projects. Barring CCS, the program predominantly apportions funds grounded in energy decarbonization criteria.

While fairly straightforward and effective in promoting a reduction in GHG emissions, this approach might inadvertently overlook innovations that can also significantly contribute to reducing industrial emissions, albeit not directly through energy decarbonization.[163]

### b. Germany

In June 2023, Germany's federal government launched a project-based pilot funding program for CCfDs focused on the steel, ammonia, cement, lime, paper, or glass sectors. The program aims to introduce CCfDs to compensate energy-intensive companies for the additional costs associated with low-carbon production that would otherwise not be profitable.[164] The CCfD upcoming program will use an auction process in which participating companies are required to bid on the amount of government support they need to abate one ton of $CO_2$ using their transformative low-carbon technology. A competitive selection process is then applied, where companies that can transition their production at the lowest cost are granted a 10 to 15-year CCfD contract.[165]

The auction pilot program for CCfDs will have the following characteristics. Bidders will undertake a comprehensive evaluation of their funding gap, employing a comparative analysis between a conventional plant and their low-carbon project. The bid submission process involves adherence to specified parameters, such as compliance with the EU-ETS, consideration of energy prices, and determination of the maximum permissible bid. Subsequently, annual payments for operational expenses are tied to fluctuations in energy and $CO_2$ prices, with a proactive approach to hedging against potential price risks. Notably, public funding is disbursed only when deemed necessary, functioning as a safeguard against undue financial support. The repayment structure is contingent upon specific years during which operational costs for the conventional plant surpass those associated with the low-carbon facility, a scenario often precipitated by elevated $CO_2$ prices.[166]

163 Gerres, and Linares, *Carbon Contracts for Differences (CCfDs) in a European Context.*

164 "Preparatory Procedure for the Climate Protection Agreements Funding Program," Federal Ministry for Economic Affairs and Climate Action, June 5, 2023, https://www.bmwk.de/Redaktion/DE/Artikel/Klimaschutz/klimaschutzvertraege-vorverfahren.html.

165 "Climate Protection Agreements Funding Program," Federal Ministry for Economic Affairs and Climate Action, March 10, 2024, https://www.bmwk.de/Redaktion/DE/Artikel/Klimaschutz/klimaschutzvertraege.html.

166 *The German Carbon Contracts for Difference (CCfD) Scheme* (Berlin: Federal Ministry for Economic Affairs and Climate Action, June 2023), https://www.bmwk.de/Redaktion/DE/Downloads/klimaschutz/introduction-ccfd_en.pdf?__blob=publicationFile&v=6.

In practice, companies must engage in a meticulous calculation process to determine their "base price" for participating in the bidding procedure (similar to the "base rate" in the Netherlands' SDE++). This entails an assessment of the $CO_2$ price per ton that would enable a transition to a low-carbon plant. The calculated base price undergoes annual adjustments, aligning with the dynamic market prices of energy sources. Subsequently, the effective $CO_2$ price is subtracted from this baseline, resulting in either disbursement to the company or eventually payback to the government for any surplus, as shown in the graph below:

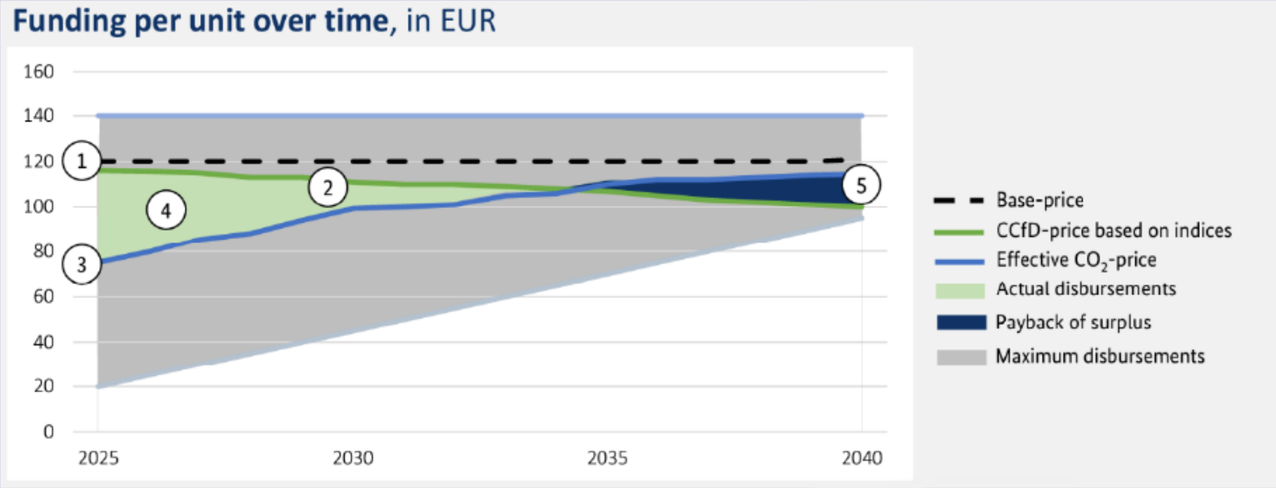



**Figure 5. Functioning of CCfD over time.**

*Source: Federal Ministry for Economic Affairs and Climate Action of Germany*

The preparatory process was conducted in the Summer of 2023. The first round of auctions started on March 2024 and will go on for four months, where all companies that participated in the preparatory process can apply for 15-year CCfDs (or Climate Protection Agreements, as they are called by the German government). The funding for these contracts will be of 4 billion euros.[167]

167 "Climate Protection Agreements Funding Program."

## Box 9: A Window Opportunity for Hydrogen

CCfDs for industrial applications were first mentioned by Germany in the National Hydrogen Strategy.[168] From the policy proposal of CCfDs in Germany, any hydrogen project in compliance with the EU taxonomy will qualify for the low-carbon technology for CCfD application. This includes green hydrogen generated by renewable energy, pink hydrogen powered by nuclear energy, and blue hydrogen produced from natural gas with CCS. Yet, green hydrogen will be prioritized and receive more subsidies than any other types of hydrogen.[169] As announced by the German government, this is part of its strategy to achieve its net-zero emission goals.[170]

168 "What Actually are Carbon Contracts for Difference?" Federal Ministry for Economic Affairs and Climate Action, https://www.bmwk-energiewende.de/EWD/Redaktion/EN/Newsletter/2020/11/Meldung/direkt-account.html.

169 Rachel Parkes, "Hydrogen in Industry | Germany to Set Aside Roughly €50bn for Carbon Contracts for Difference Subsidy Scheme," *Hydrogeninsight,* June 5, 2023, https://www.hydrogeninsight.com/policy/hydrogen-in-industry-germany-to-set-aside-roughly-50bn-for-carbon-contracts-for-difference-subsidy-scheme/2-1-1462051

170 "Climate Action," Federal Ministry of Finance (Germany), 2022, https://www.bundesfinanzministerium.de/Web/EN/Issues/Priority-Issues/climate-action/climate-action.html.

### c. Canada

Canada is the first non-EU country to declare its commitment to implementing CCfDs. In November 2023, the Finance Ministry, as outlined in its Fall Fiscal Update, disclosed an allocation of C$ 7 billion through the Canada Growth Fund, designating it as the primary funding source for CCfDs.[171]

Given the absence of a robust carbon market in Canada, the Canadian government envisions utilizing CCfDs as a hedging mechanism against potential fluctuations in future carbon prices. The approach involves the Canada Growth Fund entering into long-term contracts with companies, establishing an elevated strike carbon price. If the carbon price attains or surpasses the strike price, the government is relieved of any payments to the company. However, if future carbon pricing diminishes or undergoes changes that reduce the price below the strike price, the government compensates the company for the difference. This strategy aims to ensure the viability of investments in low-carbon technologies, contingent on these technologies costing less than what the company would pay in carbon pricing without their implementation.

Although the announcement suggests that the Canadian Growth Fund is currently negotiating CCfDs with a number of companies,[172] the comprehensive legal and regulatory framework required for CCfD execution remains uncertain. While the announcement may initially seem to signify progress in climate action within the country,[173] there is a prevailing concern among climate advocates that CCfDs might primarily support CCS projects initiated by oil and gas companies, impeding the imperative phasing out of fossil fuels in Canada.[174] The ultimate impact of CCfDs on the types of projects funded remains uncertain, yet their ideal use would be to foster solutions for hard-to-abate industries, rather than perpetuating financial support for continued fossil fuel development and extraction.

171 *Fall Economic Statement 2023: Building an Economy That Works for All Canadians* (Ottawa: Department of Finance Canada, November 2023), https://www.budget.canada.ca/fes-eea/2023/report-rapport/chap3-en.html#tax-credit.

172 *Fall Economic Statement 2023: Building an Economy That Works for All Canadians.*

173 Jennifer L "Canada Insures Carbon Price Contracts with $7B Funding," *CarbonCredits,com*, November 24, 2023, https://carboncredits.com/canada-insures-carbon-price-contracts-with-7b-funding/.

174 Ecojustice, "Ecojustice Reacts to Federal Fall Economic Statement," press release, November 21, 2023, https://ecojustice.ca/news/ecojustice-reacts-to-federal-fall-economic-statement/.

### d. Other initiatives

In other EU Member States such as Belgium, Poland, France, Sweden, and Spain, CCfDs have been a discussed policy tool at the national level. Most of these countries find CCfDs particularly useful to back up a hydrogen market in their jurisdictions and have become a part of the conversation. Despite the public interest across the region, considerations to adopt CCfDs remain very incipient and lack momentum. No other country apart from the Netherlands and Germany has developed or implemented a structured CCfD scheme and questions about the practicality and financing of this tool remain. A latent concern for all of these jurisdictions is how a CCfD system would potentially align and be harmonized with the EU-ETS and generate another regional regulatory framework. Therefore, support for CCfDs is awaiting a European approach to this tool rather than developments at the national level.[175]

## 5. Synergies of CCfD & GPP: Bridging the Gaps in GPP

Both CCfDs and GPP share the goal of transitioning towards low-carbon solutions and creating markets for low-carbon products. However, CCfD is synergetic to GPP with a different focus. GPP creates a tangible demand signal for low-carbon products. CCfD, in turn, comes in as an instrument to close the loop from the supply side and assist manufacturers in overcoming challenges including the upfront costs of innovation, initial CAPEX expenditures, and ongoing operating costs. Currently, GPP initiatives are predominantly designed in a bottom-up approach to empower procurement teams across government sectors to opt for alternatives with lower emissions, especially where these options are already available at a cost that is competitive or near-competitive. This approach, however, constrains GPP's potential to catalyze new large-scale investments critical for the deep decarbonization of hard-to-abate sectors. In contrast, CCfDs offer a top-down strategy that can accelerate the realization of such projects by ensuring that GPP has access to a wider array of supply options, thereby enhancing its effectiveness and efficiency. By bridging the gap between the present market options and the future needs for sustainable procurement, CCfDs can play a pivotal role in aligning government procurement practices with long-term environmental sustainability goals.

175 Gerres, and Linares, *Carbon Contracts for Differences (CCfDs) in a European Context.*

As mentioned before, the current implementation of GPP presents multiple challenges that could hinder the large-scale deployment and commercialization of low-carbon materials. One major issue is the fragmented landscape of GPP. In many countries, the deployment of GPP is largely at local and sub-national levels, which lack the scale needed for the development of low-carbon materials. A typical local government might not present enough demand to incentivize large-scale production or adoption of sustainable technologies, making it difficult to really scale up the market of low-carbon materials that GPP could be operated in.

Additionally, public procurement often leans towards established, proven solutions potentially sidelining innovative technologies crucial for a robust low-carbon market to drive pivotal decarbonization. This is largely due to the lack of capacity and resources, especially at local and sub-national levels, while facing a myriad of procurement constraints. Consequently, local governments tend to drive procurement decisions towards solutions that are minimal in administrative overhead, technologically proven, and budget-friendly for the immediate term.[176]

Though advancements in the GPP system may help address the problem of fragmentation and limited ambition, such transition would be demand-intensive and time-consuming, as it would require an active effort of governments to work on the creation of a centralized government agency that is in charge of establishing, implementing and monitoring the GPP system and ensuring that this institution also actively creates regulation so that government procurers at the sub-national level follow the GPP guidelines and procedures. Relying solely on green public procurement may not swiftly catalyze the development of a robust market and new investments in breakthrough low-carbon technologies.

This is where CCfD can play a supporting role for GPP. CCfD offers an avenue to bolster these manufacturers and can be instrumental in surmounting the limitations of GPP, especially for those first-of-a-kind projects. For instance, the implementation of CCfD in Germany and the Netherlands are both at the national level, anchored by long-term contracts, and target fostering large-scale investments and provide stable operational support.

Another common challenge in the promotion of low-carbon products lies in the fact that these low-carbon alternatives continue to entail higher costs compared to conventional carbon-intensive products. This holds particularly true for various kinds of materials, such as hydrogen-DRI steel, low-carbon cement, and inert anode aluminum, among others.[177] While technically feasible, these products still face hurdles in commercialization. Few markets are willing to absorb the higher costs associated with these low-carbon alternatives. Even when GPP policies are in place, tendering using technical specification (setting minimum criteria requirements such as GHG benchmarks that vendors need to satisfy to be eligible for bidding), generally award the cheapest bids as long as they meet the minimal low-carbon criteria. Consequently, manufacturers continue to struggle to find a balance between charging prices that cover their costs and remaining competitive, thus hindering the low-carbon innovation process.

In countries with established carbon markets (e.g. EU-ETS), the incremental cost of low-carbon products can be partially compensated by the carbon pricing revenue. Ideally, if the carbon price is high and stable enough, there is no need for additional subsidies such as CCfDs. However, even in a mature market like the EU-ETS, prices have fluctuated widely, ranging from 0€/tCO2 to ~30€/t$CO_2$ from 2005 to 2020.[178] Despite the recent surge in EU-ETS price, it still falls short of incentivizing the switch to low-carbon technologies at scale such as renewable hydrogen and CCS.[179] Specifically, for a low-carbon product like hydrogen-DRI steel, a $CO_2$ reduction cost of 167 euros per ton of $CO_2$ is required solely for the operational cost in hydrogen DRI.[180] Even with a sufficiently high carbon price, the inherent volatility and unpredictability in future carbon pricing—due to ever-evolving market dynamics and policies—still present a palpable risk to investors.
Through CCfDs, operational costs are compensated with

176 Sartor and Bataille, *Decarbonising Basic Materials in Europe.*

177 Sartor and Bataille, *Decarbonising Basic Materials in Europe.*

178 "EU Carbon Permits," Trading Economics, https://tradingeconomics.com/commodity/carbon

179 Jakob Petutschnig, "Why are Carbon Contracts for Difference Gaining Popularity in Europe?" *Clean Air Task Force, August 25, 2022,* https://www.catf.us/2022/08/why-are-carbon-contracts-difference-gaining-popularity-europe/.

180 Hans Dambeck, Florian Ess, Hanno Falkenberg, Dr. Andreas Kemmler, Dr. Almut Kirchner, Sven Kreidelmeyer, Sebastian Lübbers, Dr. Alexander Piégsa, Sina Scheffer, Dr. Thorsten Spillmann, Nils Thamling, Aurel Wünsch, Marco Wünsch, Inka Ziegenhagen, Dr. Wiebke Zimmer, Ruth Blanck, Hannes Böttcher, Wolf Kristian Görz, Klaus Hennenberg, Dr. Felix Chr. Matthes, Margarethe Scheffler, Kirsten Wiegmann, Clemens Schneider, Dr. Georg Holtz, Mathieu Saurat, Annika Tönjes, and Dr. Stefan Lechtenböhmer, *Climate-Neutral Germany* (Berlin: Agora Energiewende, November 2020), https://www.agora-energiewende.de/publikationen/klimaneutrales-deutschland-vollversion.

payout subsidies to alleviate the burden of more expensive energy inputs and to hedge against carbon price volatility. Meanwhile, on the CAPEX front, CCfDs ensure a steady cash flow which helps reduce the cost of finance to unlock capital, especially pertinent for those first-of-a-kind facilities. Integrating CCfDs into a GPP scheme could offer advantages such as increased revenue stability, reduced financing costs, potential government cost recovery with rising carbon prices, full incentives for investment and operation, clear signaling of long-term policy commitment, and confidence in the continuous operation of clean production technologies despite variations in carbon prices.[181]

### 6. The Limitations of CCfDs

CCfD, being a relatively nascent mechanism, is presently in an incipient stage of development, and its full maturation has yet to be realized, even in jurisdictions where the system has been implemented. The limited historical data and operational experience underscore the need for comprehensive exploration and validation of the practical feasibility and efficacy of CCfD in real-world applications. Given the yet evolving nature of this instrument, it is uncertain whether it will prove effective, thus ongoing scrutiny and empirical assessment are imperative to ascertain its functionality, address potential challenges, and optimize its contribution to advancing sustainable and low-carbon objectives.[182]

Compared to many other existing GPP mechanisms or complementing tools, CCfD is more complex as it depends on multiple variables and the fluctuation of carbon prices, effectiveness of carbon markets, incremental costs of different innovative technologies, the price of raw materials or electricity, etc.[183] Its practical operational success will require extensive implementation and management, which in turn will require a significant commitment of resources from the government.

While carbon contracts can be operated without a mature carbon market in theory, in the absence of the buffer of carbon revenue, the mechanism would rely solely on government support.[184] This could potentially narrow its applicability to countries with well-established carbon markets and a steady stream of carbon revenue.

There is however a paradox of CCfDs in the context of emissions trading systems that lies in the fact that they depend on a strong carbon price to be cost-effective for public finance.[185] In other words, when entities benefit from CCfDs by securing a guaranteed future carbon price, they essentially step away from the hedging markets in the EU ETS, reducing the liquidity of the EU ETS market, which in turn hampers an efficient price formation. Thus, this move weakens the signal given by the carbon price, which is essential for the success of CCfDs. When one carbon-intensive industry is removed from the market, the carbon price stops accurately reflecting the true market situation. This, in turn, could unnecessarily prolong the use of public budgets with carbon prices being maintained artificially low.[186]

For innovations relying on electrification, particularly low-carbon steel production, CCfD's effectiveness is closely tied to electricity prices. Given the electricity prices being the pivotal component of production costs, a fixed strike price via CCfD might not always ensure a feasible business case. This necessitates a variant strike price that indexes the CCfD strike price to prevailing electricity prices, adding another layer of complexity to the mechanism.

Some may also argue that the use of CCfDs by the government burdens the public sector by unnecessarily transferring a significant amount of risk to the government, neglecting the purpose of existing markets designed for risk management, which should be absorbing the entirety of the risks. Determining fair methodologies for emission and cost reductions across sectors proves challenging. Public schemes face the complexity of allocating budgets over changing carbon

181 Karsten Neuhoff, Olga Chiappinelli, Timo Gerres, Manuel Haussner, Roland Ismer, Nils May, Alice Pirlot, and Jörn Richstein, *Building Blocks for a Climate-Neutral European Industrial Sector* (London: Climate Strategies, 2019), https://climatestrategies.org/wp-content/uploads/2019/10/Building-Blocks-for-a-Climate-Neutral-European-Industrial-Sector.pdf.

182 Andrei Marcu and Antonio Fernandez, *Reflection Note on Carbon Contracts for Difference (CCfDs)* (Brussels: European Roundtable on Climate Change and Sustainable Transition, January 2022), https://ercst.org/reflection-note-on-carbon-contracts-for-difference-ccfds/.

183 Anabel Rilling, Vasilios Anatolitis, and Lin Zheng, ""How to Design Carbon Contracts for Difference - A Systematic Literature Review and Evaluation of Design Proposals," *2022 18th International Conference on the European Energy Market (EEM),* Ljubljana, Slovenia (2022) pp. 1-8, https://doi.org/10.1109/EEM54602.2022.9921044.

184 Richstein, "Project-Based Carbon Contracts."

185 *Carbon Contracts for Difference (CCfDs) and Their Potentially Distortive Effects on Emission Markets: Call for a Comprehensive Impact Assessment* (Brussels: Europex, May 2021), https://www.europex.org/wp-content/uploads/2021/05/20210531_Europex-position-paper-on-CCfDs.pdf.

186 *Carbon Contracts for Difference: Too Many Open Questions for Implementation?* (Leipzig: European Energy Exchange, September 2021), https://www.eex.com/fileadmin/Global/News/EEX/EEX_Opinions_Expert_Reports/202109-CCfD_paper-EEX.pdf.

market prices and potential conflicts with existing policies, risking double subsidization and suboptimal fund use.[187] For instance, if companies are befitting from a green premium from another source, such as other governmental benefits (e.g. tax credits), or by marketing the green premium of their production through the sale of book and claim certificates, there should be a clear disclosure of these external funding incentives. This ensures that companies do not gain disproportionate benefits by aligning with the principle that if they receive other funding to offset the green premium, the CCfD premium should incorporate that value. This approach also aims to prevent an unjust increase in input costs for the midstream consumer, ensuring adjustments are made accordingly. This is addressed by the German government through a regulation stipulating that since the government absorbs the cost of the green premium through the CCfD, manufacturers are no longer permitted to market the "green" attributes of this steel.[188]

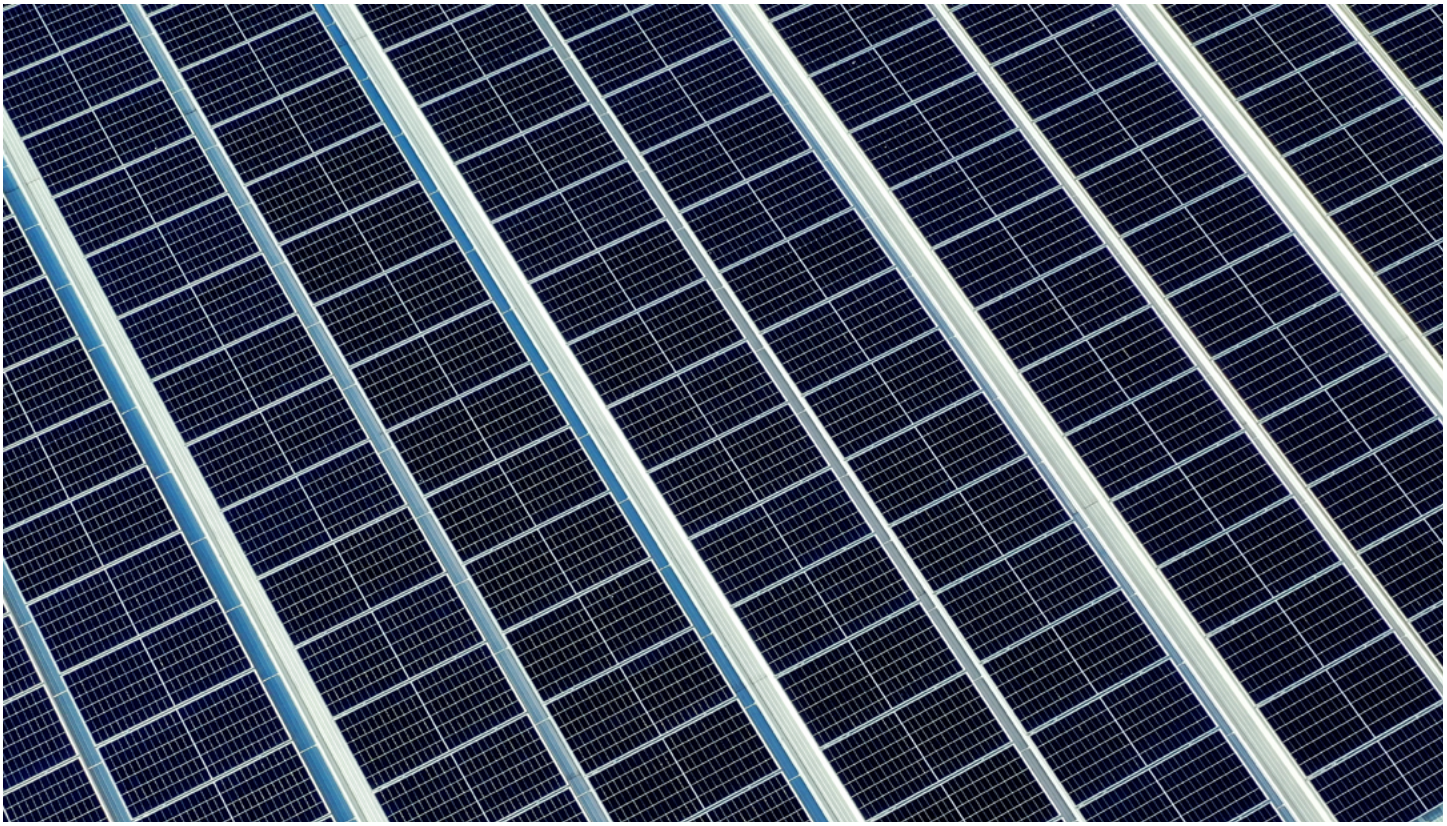
187 *Carbon Contracts for Difference: Too Many Open Questions for Implementation?.*

188 *Requirements Directive for Climate Protection Contracts: Explanations on the Funding Instrument,* (Berlin: Federal Ministry for Economic Affairs and Climate Action, June 2023), https://www.bmwk.de/Redaktion/DE/Downloads/F/foerderrichtlinie-klimaschutzvertraege.pdf?__blob=publicationFile&v=4.

Finally, a pivotal concern in this context pertains to the acquisition of necessary public funds for the implementation of CCfDs. The challenge lies in navigating the atypical nature of securing public financial support for these schemes.[189] For instance, because the cost of European Union Allowances is changing quickly and it is hard to predict exactly what it will be in the future, it is difficult to set aside the exact amount of public money needed to fund CCfDs. This makes the whole budgeting process less efficient.[190] Therefore, further exploration will be required to develop strategies and frameworks that align with the distinctive financial mechanisms inherent in CCfDs, thereby facilitating their effective implementation within established public funding structures.

189 Gerres, and Linares, *Carbon Contracts for Differences: Their Role in European Industrial Decarbonization.*

190 *Carbon Contracts for Difference (CCfDs) and Their Potentially Distortive Effects on Emission Markets: Call for a Comprehensive Impact Assessment.*



# V. Conclusion: Spillover to the Private Sector

The current GPP systems implemented across the world lack uniformity and clarity in both criteria and accounting methodologies, which impedes the effectiveness of GPP models and the progression of low-carbon materials. To facilitate the transition towards low-carbon materials, especially in hard to abate sectors, a primary requisite is the development of well-defined criteria of low-carbon materials – the definitions of what materials should be considered as low-carbon, accompanied by standardized quantification methods to assess their climate impact. Having this standardization, GPP targets can be set in place accompanied by supporting and complementing tools that address the limitations inherent to GPP.

As governments lead the way in defining and implementing green procurement practices, there's an opportunity for the private sector to follow suit, leveraging the tools, methodologies, and standards set by GPP.

## A. The Catalytic Effect of GPP on Private Sector Adoption of Low-Carbon Standards

By emphasizing the environmental impacts of products and services and setting benchmarks for low-carbon performance, governments not only raise awareness but also introduce clear standards for the industry. These practices provide a better understanding of what qualifies as "green" and "low-carbon" while enhancing the visibility and credibility of green products for private consumers. Such proactive measures can catalyze the diffusion of environmental criteria and standards into private projects as observed in previous studies.[191] Regions where GPP is actively implemented witness an increase in the private sector's green procurement through adoption of standards by private project developers and investments in green products by local suppliers.[192]

191 Timothy Simcoe and Michael W. Toffel, "Government Green Procurement Spillovers: Evidence from Municipal Building Policies in California," (Working Paper 13-030, Cambridge: Harvard Business School, May 2014), https://www.hbs.edu/ris/Publication%20Files/13-030_a79ab7b7-ad5e-4b80-9e9a-f700baaa9e68.pdf.

192 Simcoe and Toffel, "Government Green Procurement Spillovers: Evidence from Municipal Building Policies in California."

**Box 10: Spillover to the Private Sector Case**

In the United States, the demand for energy-efficient technologies experienced significant growth after a 1993 Executive Order mandated that the federal government exclusively purchase computer equipment labeled as 'Energy Star.'[193] This requirement led to a substantial transformation of the market. By the end of 1994, over 2,000 computer models met the Energy Star qualifications, with the participation of all major manufacturers. Since 1992, Energy Star has incentivized households and businesses across the United States to save a remarkable 5 trillion kilowatt-hours of electricity, amounting to over $450 billion in energy cost savings and resulting in a reduction of 4 billion metric tons of greenhouse gases. In 2019 alone, Energy Star and its collaborators conserved nearly 500 billion kilowatt-hours of electricity, preventing energy expenses equivalent to $39 billion.[194]

193 Administration of William J. Clinton, Executive Order 12845 Requiring Agencies to Purchase Energy Efficient Computer Equipment, April 21, 1993, (Executive Order for Energy Efficient Computer Equipment), https://www.govinfo.gov/content/pkg/WCPD-1993-04-26/pdf/WCPD-1993-04-26-Pg641.pdf.

194 Energy Star Impacts, Energy Star, https://www.energystar.gov/about/impacts; Executive Order for Energy Efficient Computer Equipment.

## B. Public-Private Collaboration

Green public procurement practices can further enhance the effectiveness of collaborative efforts between the public and private sectors. Initiatives like the First Movers Coalition, SteelZero, and ConcreteZero exemplify the potential of such collaborations. By aligning definitions and standards across these initiatives, there is an opportunity to create a unified approach to green procurement that's universally adopted. At COP26, the First Movers Coalition (FMC) was launched. It is a platform of companies committed to buying zero-emission goods and services by 2030, and such creating demand for low-carbon technologies and making them cost-competitive.[195] The FMC uses "its purchasing power to create early markets for innovative clean technologies across eight hard-to-abate sectors." [196] To be successful in its mission, the FMC needs a range of tools that channel purchases where they are most needed and most additional for climate action in the hard-to-abate sectors. Here, GPP tools and associated tools such as the $CO_2$PL and the CCfD demonstrate how private procurement should change and evolve from pure cost-based considerations.

## C. Innovative Tools and Models for the Private Sector

The evolution of GPP has paved the way for the development of innovative tools that can be at the service of the private sector. The CCfD model emerges as a risk-sharing instrument that transfers the uncertainties associated with the economic feasibility of novel low-carbon technologies from private entities to public stakeholders. This mechanism offers a safety net to private companies, thus bolstering their confidence to invest in progressive low-carbon solutions. Drawing parallels with Power Purchase Agreements (PPAs) in the electricity sector, CCfDs can also be conceptualized between two private sector entities. In such scenarios, governments will no longer be the direct stakeholders but facilitators, providing financial guarantees and ensuring sanctity of these contracts.

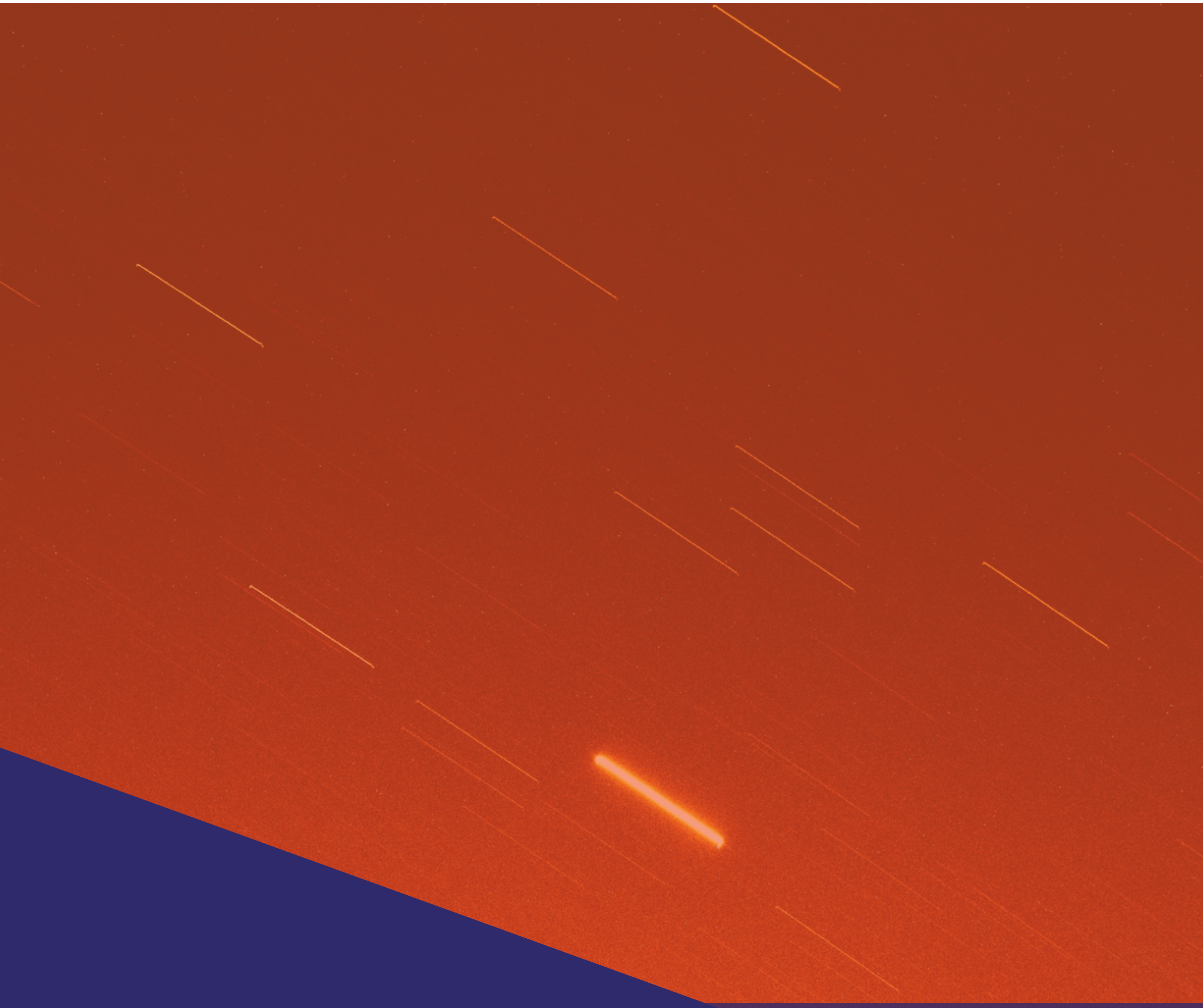
$CO_2$PL provides a model for the potential use of private procurers as well. The structured design, featuring ambition levels across its four foundational criteria, offers private producers a granular yet straightforward framework. This structure facilitates a deeper understanding of their projects and suppliers, facilitating the awarding of contracts.

Unlike public procurers bound by EU directives, private procurers can leverage $CO_2$PL with greater flexibility, free from concerns related to potential violations of the EU directives. In the tendering processes, they have the latitude to adopt more ambitious strategies. They can choose an exclusive approach by considering only those suppliers with $CO_2$PL certifications, thereby streamlining operational management. Moreover, procurers can further refine their supplier selection by setting clear thresholds based on $CO_2$PL's ambition levels, only choosing companies with certain ambitious levels or above and ensuring alignment with their sustainability goals.

195 "First Movers Coalition," World Economic Forum, https://www.weforum.org/first-movers-coalition.

196 "First Movers Coalition."

COMET Coalition On Materials Emissions Transparency



The Coalition on Materials Emissions Transparency (COMET) accelerates supply chain decarbonization by enabling producers, consumer-facing companies, investors, and policymakers to better account for greenhouse gas (GHG) emissions throughout materials supply chains, in harmony with existing GHG accounting and disclosure methods and platforms.

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